SEPTEMBER 1, 1961

AUTOMOTIVE INDUSTRIES

ENGINEERING · MANAGEMENT · PRODUCTION · DESIGN

A CHILTON PUBLICATION

MAKING PRODUCTION PAY

MACHINE TOOL AND PRODUCTION EQUIPMENT ISSUE

ALSO IN THIS ISSUE

Major Allies in Automotive Reliability

By Ludlow King, Exec. Vice President, NMTBA . . . See page 73

SPECIAL Metalworking Improvement Planning Chart

Inside Back Cover

another torture test for leaded alloy

This guide bushing is a much abused part in a pneumatic rock drill—subjected to severe shock loads and a shattering type of vibrational stress. It is machined from a bar of lead-treated* Aristoloy 8620, carburized and hardened to a 58-63 Rockwell "C". When GARDNER-DENVER switched to lead-treated steel, they happily discovered production jumped 42%. Feed rates, drilling, turning, forming, boring, and cut-off operations could also be increased. Tool life was extended 20 pieces between grinds.

For complete information about how you can get alloy steel strength in free-machining steel, call your nearest Copperweld representative. Or write for Leaded Steels Catalog and Products & Facilities Catalog.

*Inland Ledloy License

ARISTOLOY STEELS

DIVISION OF
COPPERWELD
STEEL COMPANY

ARISTOLOY STEEL DIVISION 4025 Mahoning Ave., Warren, Ohio · EXPORT: Copperweld Steel International Co., 225 Broadway, New York 7, N. Y.

(Advertisement)

SILICOLOGY

Studies in Silicones

HOW THESE TIME-TESTED MATERIALS CAN WORK FOR YOU

Do You Control Motion? Restrain, Release It? Silicone Fluids Are Helping Rewrite the Rules

Need a big-muscled spring to fit a pint-size space? You can now get a fluid spring 1/40 the size of an equivalent coil spring. Need a hydraulic shock absorber with a "flat-topped" energy absorption curve between minus 60 and plus 500 deg. F.? You can now get it. Want the two in one unit? You can get that, too.

The common denominator of such high-performance devices is a series of UNION CARBIDE Silicone Fluids. They range in viscosity from 10 centistokes to 100,000, with pour points as low as minus 85 and flash points above 600 deg. F.

MILLION POUND CAPACITY. This revolutionary, patented 1,000,000-pound Taylor liquid spring utilizing the precisely known compressibility of UNION CARBIDE Silicone Oil, is said to be the highest force spring ever produced in a single unit. Only a foot in diameter, it could support three of the largest locomotives. On top of it sits Taylor's smallest liquid spring. Beside it is a locomotive coil spring of almost the big spring's size, but providing only 10 tons of force.

COMPRESSIBILITY PLUS STABILITY

Two of silicone fluids' outstanding properties contribute greatly to their growing usefulness in a variety of hydraulic devices including springs, shock absorbers, torque convertors, dash pots, valve lifters, many more. These are compressibility—the highest known for polymeric fluids—combined with stability at temperature extremes.

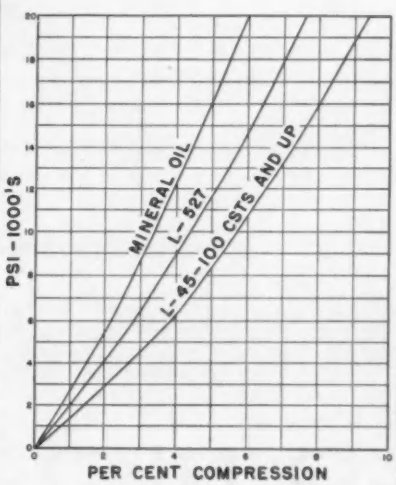
The per cent compressibility of UNION CARBIDE L-45 and L-527 Silicone Fluids, compared to conventional mineral oil, is shown in the accompanying chart. The viscosity temperature coefficient $\left(1-\frac{V210°F.}{V100°F.}\right)$ for L-45 with nominal viscosity of 100 ctsk. is 0.63.

NAME YOUR OWN SPRING RATE

Taylor Devices, Inc., of North Tonawanda, N. Y., is one of the companies adapting these highly useful qualities to hydraulic equipment. In tension and compression devices, for example, using a stepped tubular piston design and L-45 fluid, they achieve virtually any desired spring rate and force, within a compact, structurally stable mechanism.

Again, in spring-shock absorbers where high mechanical energy is converted to heat energy, Taylor Devices find UNION CARBIDE Silicone Fluids greatly extend the useful work range of the units.

Among the jobs such devices are performing are: Scram-rod cushions in nuclear reactors, taking impact loads on aircraft arresting hooks, cushioning aircraft radar antennas. In addition, they arrest circuit breaker mechanisms at interruption, stop rolls of paper on paper machines, and control feed rate of electrodes on electric furnaces.



Compressibility of UNION CARBIDE Silicone Fluids vs. Mineral Oil

R AND D TO HELP YOU

If you design hydraulic equipment for tough duty, your UNION CARBIDE Silicones Man has a wealth of technical know-how on the ways Silicone Fluids can help you obtain outstanding performance. Behind him are the vast experience and research of Union Carbide Corporation in virtually every field of industry.

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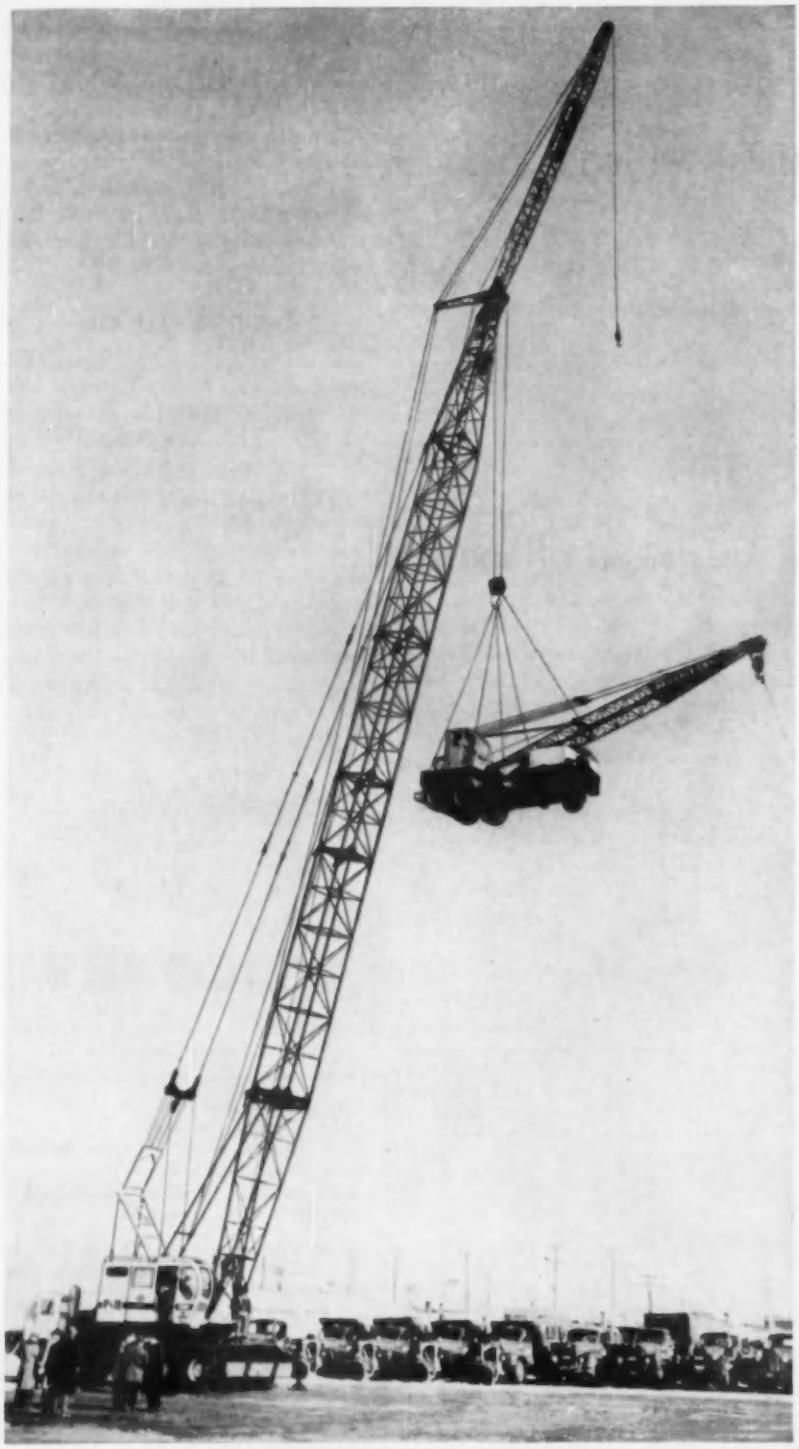

Nickel-moly steels give power train strength and toughness

Rolling on twelve huge tires and wielding a 250-foot boom, this bruiser can handle 90-ton loads with ease. Here you see it dangling its 31,000 pound "little brother" at a demonstration given by the manufacturer, Harnischfeger Corporation of Milwaukee.

At the planning stage, their engineers anticipated great operating stresses, designed critical power-train components around the properties of nickel-molybdenum alloy carburizing steels.

AISI 4820 (3½% nickel) is specified for the most heavily stressed transmission gears and auxiliary transmission gears. These components are carburized and hardened to handle the highest compressive loads, and at the same time develop high core strength and toughness to resist severe torsion and impact.

AISI 4620 (1.8% nickel) is used for a variety of gears, shafts, and pinions which encounter all but the most severe stresses.

When you design, order, or build construction machinery, count on nickel-moly steels to deliver the specific combinations of properties that give heavy equipment built-in strength and toughness.

You'll find materials-engineering data on 11 types of heavy construction equipment in a new 76-page Inco booklet. For a free copy, request "A-265."

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AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE • PUBLISHED SEMI-MONTHLY

SEPTEMBER 1, 1961 VOL. 125, No. 5

MACHINE TOOL AND "Making PRODUCTION Pay" EQUIPMENT EDITION

MAJOR ALLIES IN AUTOMOTIVE RELIABILITY .....PAGE 73

By Ludlow King, Executive Vice President, National Machine Tool Builders' Association

In this article Mr. King tells how the machine tool industries cooperate to advance the reliability aspects of automotive programs

WHY REVIEW PRODUCTION EQUIPMENT NOW? .....PAGE 75

By Joseph Geschelin, Detroit Editor

This article is devoted to advances and developments in the production equipment used by the automotive industries

AUTOMOTIVE METALWORKING IMPROVEMENT PLANNING SECTION .....PAGE 76

By Charles A. Weinert, Eastern Editor

For the first time, an encyclopedic study has been prepared showing more than 400 examples of specific improvements in the production of major automotive components

Making ENGINE Production PAY . . . . . PAGE 78

This section is devoted to cylinder blocks and heads, crankshafts, camshafts, pistons, pins, rods, valves, rocker arms, manifolds, flywheels, etc.

Making POWER TRAIN Production PAY . . . PAGE 92

Time-saving methods for turning out clutch parts, transmission stators, valve bodies, housings, gears and shafts, universal joints, rear axles, etc.

Making CHASSIS Production PAY . . . . . PAGE 102

Latest equipment for automatic assembly, machining, welding, etc., of brake shoes, wheel cylinders, steering housings, gears, knuckles, and wheel hubs

Making BODY Production PAY . . . . . PAGE 108

Case examples of improvements in making panels, door locks and gears, hardware, window regulators, seat frames and adjusters, and other body components

Making ELECTRICAL Production PAY . . . . . PAGE 111

Housings, cams, shafts, gears, armatures, spark plugs, bearings, distributor caps, and starter pinions are produced on new, cost-saving equipment

Making "OTHER" Production PAY . . . . . PAGE 114

Improved machines for toolroom and experimental work, efficient thread-rolling machines, special cold-heading equipment, and other devices for making miscellaneous items

. . . continued on next page

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Business Publications Audit of Circulation

AUTOMOTIVE INDUSTRIES is a consolidation of The Automobile (weekly) and the Motor Review (weekly) May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

EDITORIAL EXECUTIVE OFFICES, Chestnut and 56th Sts., Philadelphia 39, Pa., U. S. A. Cable address—Autoland, Philadelphia.

AUTOMOTIVE INDUSTRIES. Published semi-monthly by Chilton Company, Chestnut & 56th Sts., Phila. 39. Second Class Postage Paid at Philadelphia, Pa. Subscription price: To manufacturers in and suppliers to the automotive industries in the U. S. & U. S. Possessions, $2.00 per year; $3.00 for 2 years. Canada $5.00 per year. All others $10.00 per year. Single copies, 75¢. Statistical Issue and Products Guide Issue, $2.00 each net. National Auto Show Issue, $1.50 per copy net.

AUTOMOTIVE INDUSTRIES

News Previews • • •

Cardinals Tested on Detroit Streets 53

Ford, Oldsmobile Unveil New Models 54

2 Makers Have Lifetime Lubrication on '62 Cars 55

Navy Awards Jet Engine Contracts 63

GM Displays Multi-Fuel Engine 63

Mercedes-Benz Offers Mobile Home 64

Ferguson Racing Car Has Four-Wheel Drive 65

Armco Steel Has New Zinc Coating Line 66

Ford Earnings Soar for First Six Months 66

GM Net Income of $440 Million Shows Drop 66

Departments • • •

Calendar of Coming Events 8

Letters to the Editor 13

News of the Automotive and Aviation Industries. *By James Dunne and C. B. Campbell* 53

Metals News. *By William F. Boericke* 56

Tabloid 64

Industry Statistics. *By Marcus Ainsworth* 67

Men in the News 69

Editorial Page. *By Hartley W. Barclay* 71

New Automotive and Aviation Products. *By C. J. Kelly* 123

On Our Washington Wire 128

Manufacturers' News 129

Airbriefs. *By R. Raymond Kay* 142

Advertisers' Index 168

Free Technical Literature .....At Back of This Issue

Metalworking Improvement Planning Chart..At Back of This Issue

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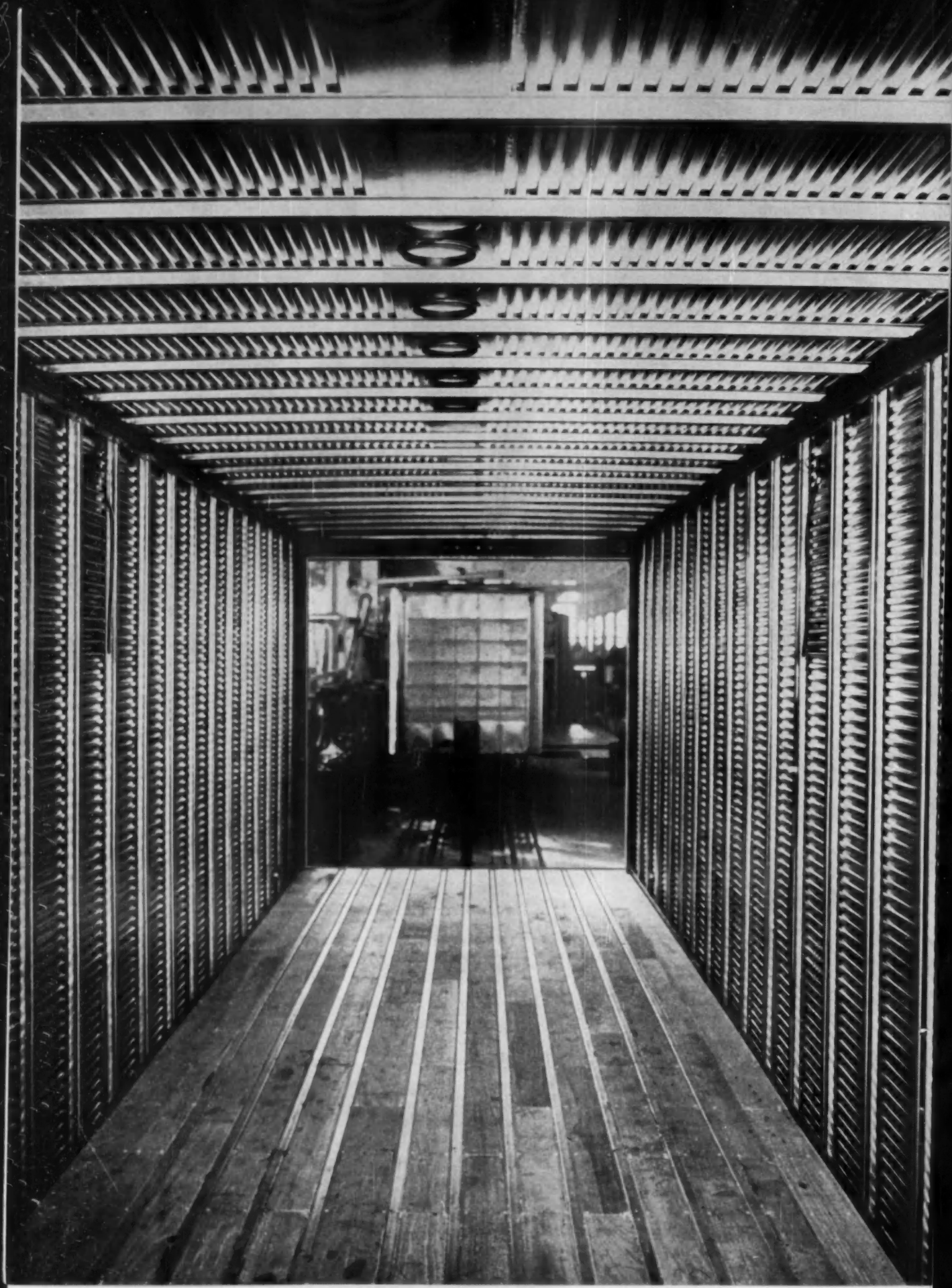

MECHANICAL PROPERTIES*

	YOLOY E HSX	YOLOY E HS	YOLOY E ACR
Carbon, max. %	.18	.18	.10
Manganese, max. %	1.00	1.00	.60
Phosphorus, max. %	.09	.10	.05
Sulphur, max. %	.05	.05	.05
Silicon, max. %	.30	.30	—
Copper %	.20/.50	.20/.50	.25/.50
Nickel %	.40/1.00	.40/1.00	.60 max.
Chromium %	.20/.60	.20/.60	.35 max.
Yield point, psi	45,000 min.	50,000 min.	45,000 max.
Tensile Strength, psi	80,000 max.	70,000 min.	60,000 max.
Elongation in 2", %	25.0 av.	.22 min.	30.0 av.

*Mechanical properties for Yoloy E steels up to ½" in thickness.

ADDITIONAL TYPICAL MECHANICAL PROPERTIES

Ultimate compressive strength: equal to tensile strength.
Ultimate shearing strength: equal to ¾ of tensile strength.
Modulus of elasticity, psi _____ 29,000,000

ASTM STANDARD COLD BEND TESTS

½" thick and under shall bend 180° around pin whose diameter is equal to one (1) times thickness of sheet, plate or bar.

Over ½" thick shall bend 180° around pin whose diameter is equal to two (2) times thickness of the bar or plate.

FABRICATING PRACTICE FOR COLD FORMING

THICKNESS OF PRODUCT	YOLOY E HS SUGGESTED MINIMUM INSIDE RADII	YOLOY E HSX SUGGESTED MINIMUM INSIDE RADII
up to 1/16" inclusive	1 x thickness	1 x thickness
Over 1/16" to 1/4" inclusive	2 x thickness	1½ x thickness
Over 1/4" to 1/2" inclusive	3 x thickness	2½ x thickness

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Yoloy steels are a product of Youngstown integrated steel-making where quality and delivery are rigidly controlled from mine to open hearth to high-tensile cut plate and coiled sheet. For your high strength steel needs, choose Yoloy, one of over 800 quality steels from Youngstown.

Youngstown – growing force in steel

For more information about Yoloy Steel, write: Department 38.
The Youngstown Sheet and Tube Company, Youngstown, Ohio

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CALENDAR

OF COMING SHOWS AND MEETINGS

Combined Farm, Construction and Industrial Machinery; Powerplant; and Transportation Meeting. (Including Production Forum and Engineering Display), Milwaukee	Sept. 11-14
Instrument Society of America, Fall Instrument - Automation Conference, Los Angeles	Sept. 11-15
Society of Automotive Engineers, National Farm, Construction, and Industrial Machinery Meeting, Milwaukee	Sept. 11-15
Society of Plastics Engineers "Plastics for Tooling," Indiana Section, Indianapolis	Sept. 12
Marking Device Association, Convention, Chicago	Sept. 13-15
Non-Ferrous Founders Society, Annual Meeting, Shawnee-On-Delaware, Pa.	Sept. 18-20
Steel Founders' Society of America, Fall Meeting, Homestead, Hot Springs, Va.	Sept. 18-20
2nd Industrial Building Exposition and Congress, New York	Sept. 25-28
American Production and Inventory Control Society, 4th Annual National Conference and Technical Exhibit, Chicago	Sept. 28-29
National Association of Corrosion Engineers, Western Regional Conference, Portland, Ore.	Oct. 4-6
American Machine Tool Distributors' Association, Annual Meeting, Pittsburgh	Oct. 4-6
American Foundrymen's Society, 9th Ohio Regional Foundry Conference, Cincinnati	Oct. 5-6
Society of Automotive Engineers, National Aeronautic Meeting, Los Angeles	Oct. 9-13
American Standards Association, 12th National Conference on Standards, Houston	Oct. 10-12
National Screw Machine Products Association, Membership Meeting, White Sulphur Springs, W. Va.	Oct. 12-15
American Institute of Electrical Engineers, 1961 Machine Tools Industry Conference, Rockford, Ill.	Oct. 16-18
Magnesium Association Annual Convention, New York	Oct. 16-18
American Society of Lubrication Engineers, 8th Joint Lubrication Conference, Chicago	Oct. 17-19
American Society of Body Engineers, 16th Annual Technical Convention, Detroit	Oct. 18-20
American Foundrymen's Society, Michigan Regional Foundry Conference, Michigan State U., Michigan	Oct. 19-20
1961 National Conference on Industrial Hydraulics, "Versatility and Reliability of Fluid Power," Chicago	Oct. 19-20

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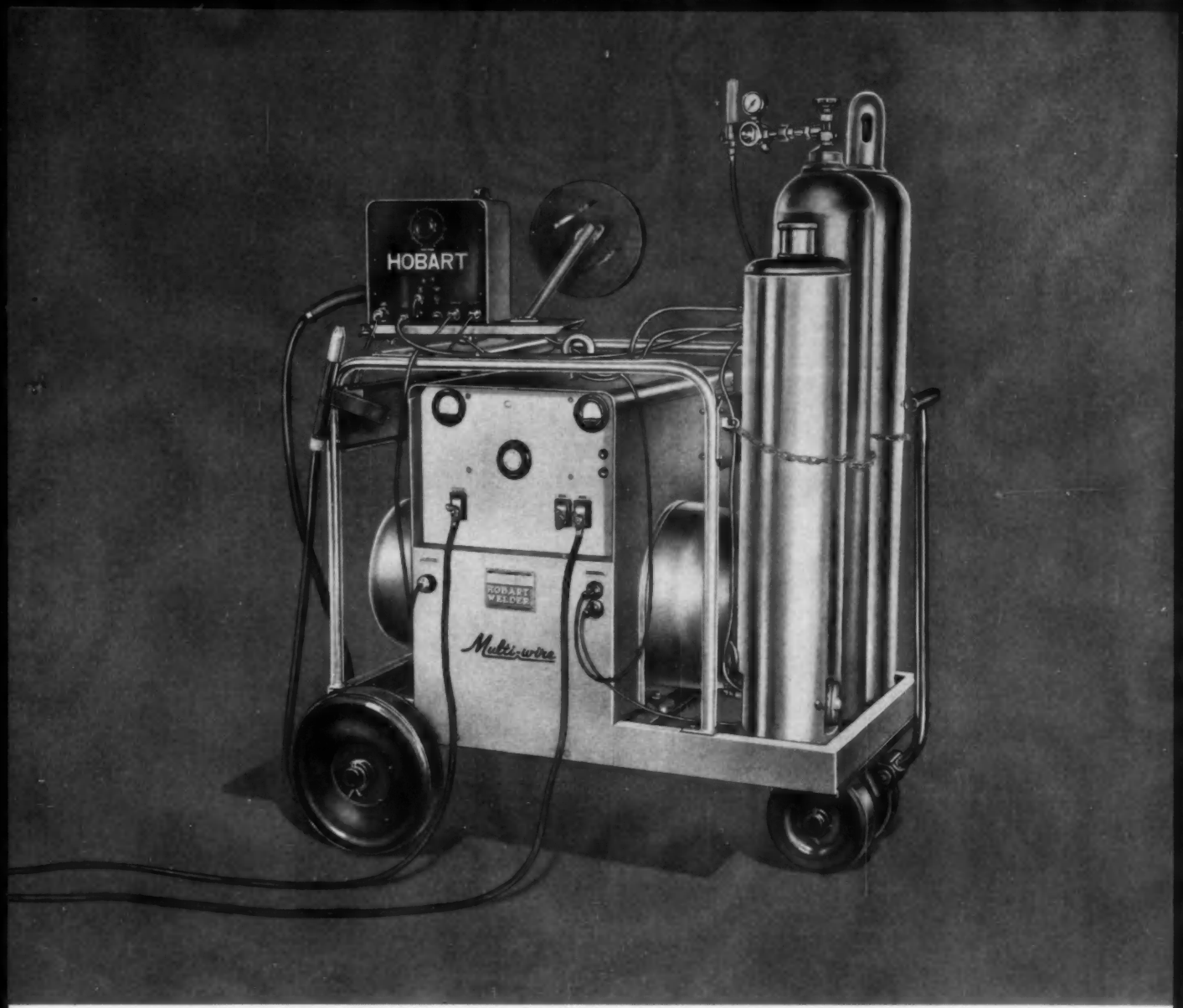

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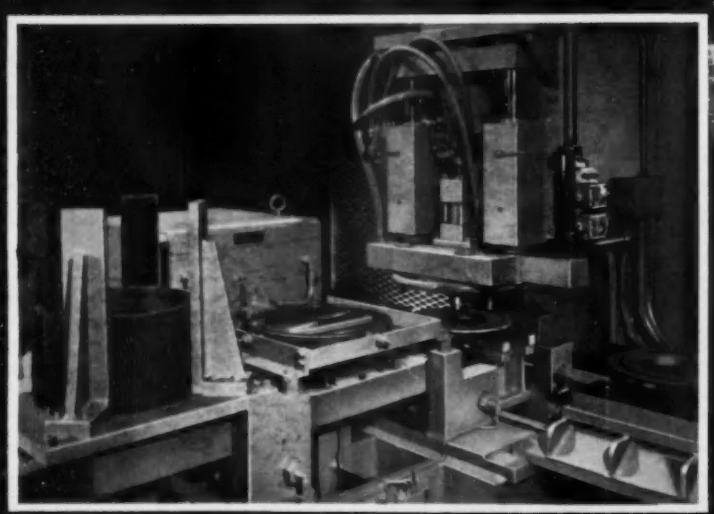
In Section I, tool slide units pivot to a convenient position for ready access to cutting tools.



The ring gears, stacked at the left, are heated in an induction coil in the center, pressed on the flywheel at the right and shrunk in position by a cold air blast.

Another Automation First by Cross

Transfer-matic Completely Processes Flywheels and Assembles Ring Gears

Machining Operations Include Facing, Turning, Boring, Chamfering, Drilling and Tapping

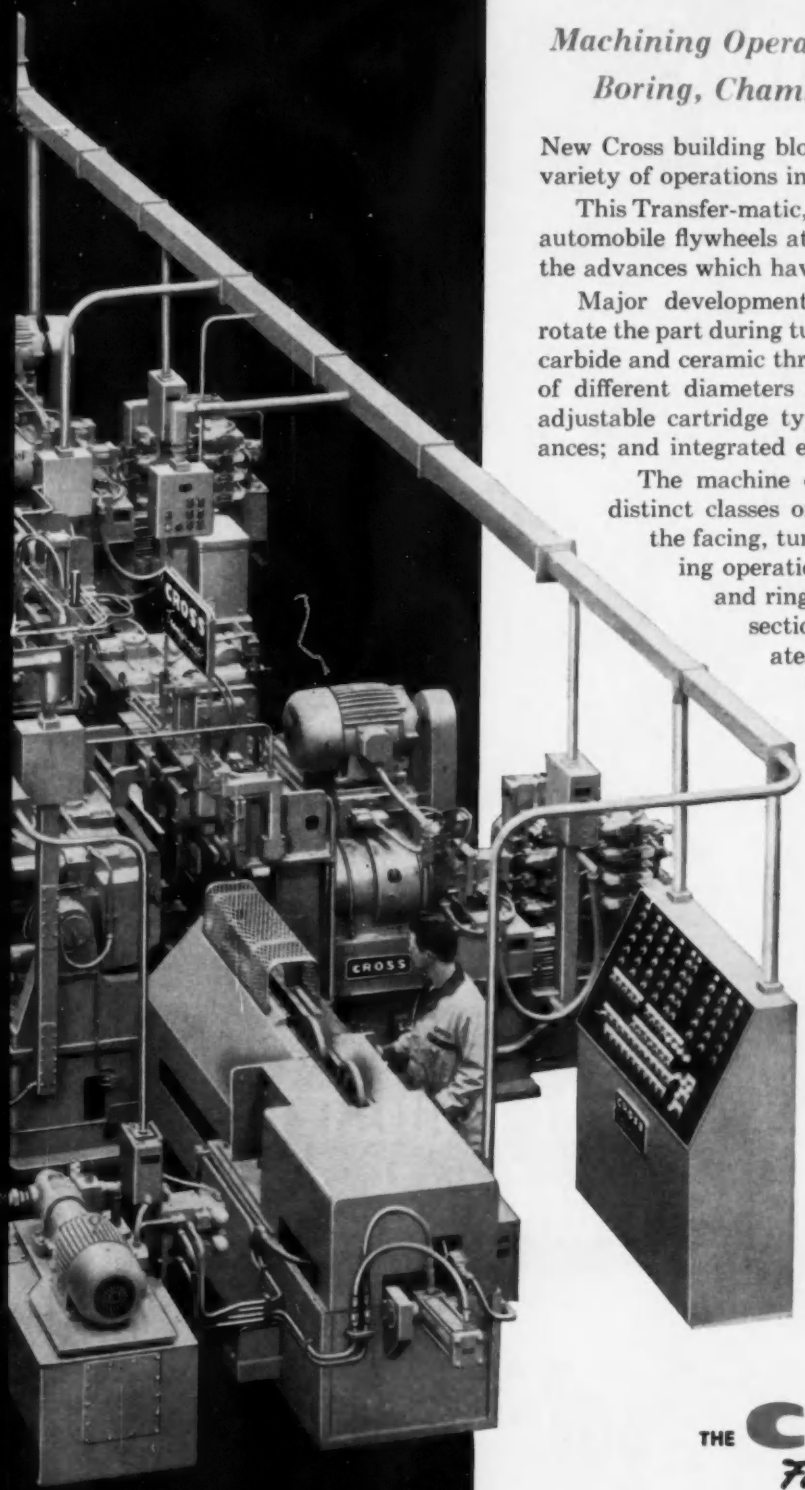
New Cross building blocks make it possible to complete a wide variety of operations in addition to drilling and boring.

This Transfer-matic, which completely processes two different automobile flywheels at the rate of 132 per hour, is evidence of the advances which have been made.

Major developments include standard chucking units to rotate the part during turning, facing, and boring; the use of both carbide and ceramic throw-away inserts to assure proper cutting of different diameters at a single spindle speed; individually adjustable cartridge type tool holders to maintain close tolerances; and integrated equipment to assemble the ring gear.

The machine consists of two sections to handle two distinct classes of operations. The first section performs the facing, turning, boring, undercutting and chamfering operations. Drilling, reaming, tapping, cleaning and ring gear assembly take place in the second section. The two sections are normally operated as one machine. A banking station between sections permits either to continue when the other is stopped for tool changes.

Quick changeover for the two flywheel designs is achieved by such features as the use of eccentric spindles to machine different hole patterns.



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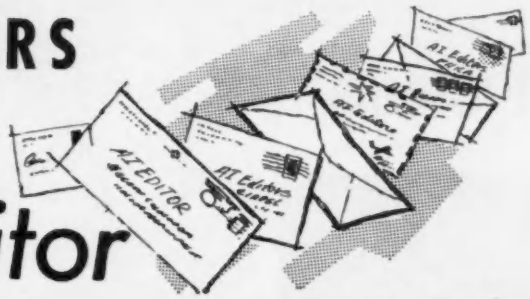


Readers' opinions or requests for additional information on material appearing in the editorial pages of AUTOMOTIVE INDUSTRIES are invited for this column. No unsigned letters will be considered, but names will be withheld on request. Address *Letters to the Editor*, AUTOMOTIVE INDUSTRIES, 56th & Chestnut Sts., Philadelphia 39, Pa.

EPOXIES

Part II of "Plastics in the Automotive Industries" was every bit as good as, if not better than, Part I—and you know how we felt about your story on nylon. This should be quite a series.

R. J. McGlew
E. I. du Pont de Nemours & Co.
Wilmington, Del.

I want to compliment you on your excellent article of July 15th covering the subject of epoxies. The data contained therein is extremely valuable.

Are you planning some special reprints of this section?

John Delmonte
President
Furane Plastics Inc.
Los Angeles, Calif.

● *Happy to say that orders for reprints have been overwhelming. —Ed.*

Your plastics articles are very interesting and complete, and we offer our compliments on the accuracy of your presentation.

We would like to consider ordering reprints of the current article "Part II Epoxies." Would you be able to get us price quotations on 1000 copies plus additional thousands up to 5000.

E. H. Wiard
Market Services Division
Ren Plastics, Inc.
Lansing, Mich.

● *Quotations are on the way.—Ed.*

INDY

I enjoyed every word of your "500" story and I'm sure no one did a better job of dealing with the deciding factor in the battle for first place. Most writers emphasized the importance of Eddie's tire wear, but overlooked the fact that it was caused by his full fuel load. Congratulations for telling the complete story so clearly.

Al Bloemker
Indianapolis Motor Speedway Corp.
Speedway, Ind.

GRAY IRON

We are delighted with your July 15 cover story about Gray Iron and Sibley Vice President, John McIntyre. It represents the other side of the changing materials picture which we hope will be given more space in future issues of the trade press.

William H. Voll
Sales Manager
Sibley Machine & Foundry
South Bend, Ind.

We wish to thank you for the fine coverage you gave the Gray Iron Founders Society in the July 15 issue of your publication. Your graphic treatment was outstanding and you are to be congratulated on this excellent presentation.

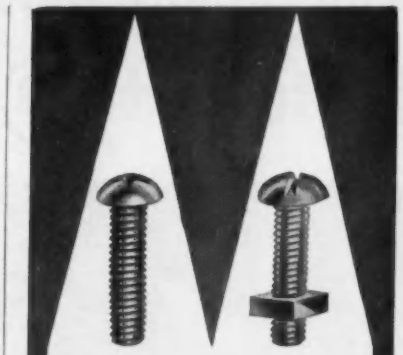
Stanley S. Greene
Director of Public Relations
Ashby & Associates
Cleveland, Ohio

ANTI-SMOG

We are interested in obtaining information concerning the status of anti-smog mufflers in California. Do you have any information, articles, etc., which relate to the technical requirements and specifications of such devices and their manufacture.

R. E. Peper
Corporate Planning
Thiokol Chemical Corp.
Bristol, Penna.

● *Information is on the way.—Ed.*



FOR VARIETY

STANDARDIZE 100% ON SOUTHERN FASTENERS

A stock of 1,500,000,000 USA-made fasteners means that Southern's variety of items, sizes, materials, head styles and finishes can be your source of constant supply. Standardize 100% on Southern fasteners, and forget about carrying a large, costly, space-consuming inventory. Let Southern's variety and famous service help solve your fastener problems.

It will pay you to try Southern on your next order. Write today, using your letterhead, for our Stock List showing current variety of fasteners ready for delivery in large or small quantities. Address: Southern Screw Company, P. O. Box 1360, Statesville, N. C.

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Types 1, 23 & 25 Thread Cutting Screws • Types A, B, C, & F Tapping Screws • Machine Screws & Nuts • Stove Bolts • Drive Screws • Carriage Bolts • Continuous Threaded Studs • Wood Screws • Hanger Bolts

Southern SCREW COMPANY
STATESVILLE • NORTH CAROLINA

Circle 112 on Inquiry Card for more data

Send for new movie, "How to Weld USS 'T-1' Steels"

This mark tells you a product is made of modern, dependable Steel.

This new 18-minute, 16mm color motion picture shows concisely the practices involved in welding USS "T-1" Steels. If you are fabricating "T-1" Steel in your shop, this film and copies of the booklet will be a big help in demonstrating the proper technique to your welders. Fill out the coupon below and indicate the number of booklets you will need.

Included in the booklet is a handy welding heat-input calculator that helps a welder choose the proper welding machine settings. The film, together with the booklet, will help every welder to weld USS "T-1" Steels readily and successfully.

We'll gladly lend you the film and furnish enough free copies of the booklet and heat-input calculator for your shop personnel. USS and "T-1" are registered trademarks.

United States Steel Corporation • Columbia-Geneva Steel Division National Tube Division • Tennessee Coal and Iron Division • United States Steel Supply Division • United States Steel Export Company

United States Steel
525 William Penn Place, Room 6354
Pittsburgh 30, Pennsylvania

Gentlemen:

Please lend me your 16mm color, sound movie, "How to Weld USS 'T-1' Steels." Also, send me_____booklets of the same title. I understand there is no obligation.

Name_____

Title_____

Company_____

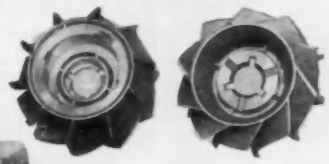
Address_____

City_____ **Zone**_____ **State**_____

United States Steel

Let the work size, operations, finish or output change . . .

Standard Ex-Cell-Os will meet your needs!



Double-end Model 752 (shown at left) finish-machines both sides of this torque converter stator in one cycle at a rate of 140 per hour. Standard tooling, spindles, and other components permit fast change-over from this job's boring, turning, facing, grooving and chamfering operations to any required single or multiple functions.

Close center-distances are held on this transmission pump cover, one of three different parts finished on a single-end Model 751 Precision Bore. Cross slide indexes during each cycle, and a common spindle bores the dowel holes. One or more Heavy Duty or Ultra-Precision Spindles can be used in place of the three Ex-Cell-O Square Body Spindles shown.

Modern Ex-Cell-Os represent over 30 years of specialization in Precision Boring Machines. Your Ex-Cell-O Representative has data on a wide variety of standard, special and building-block types to quickly provide optimum equipment utilization in your plant. Call him soon, or write direct for details.

61-16M

EX-CELL-O FOR PRECISION

PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • JIG AND FIXTURE COMPONENTS • TORQUE ACTUATORS • CONTOUR PROJECTORS GAGES AND GAGING EQUIPMENT • GRANITE SURFACE PLATES • COMPUTER PRODUCTS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • ATOMIC ENERGY EQUIPMENT • DAIRY AND OTHER PACKAGING EQUIPMENT

Machinery Division

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DETROIT 32, MICHIGAN

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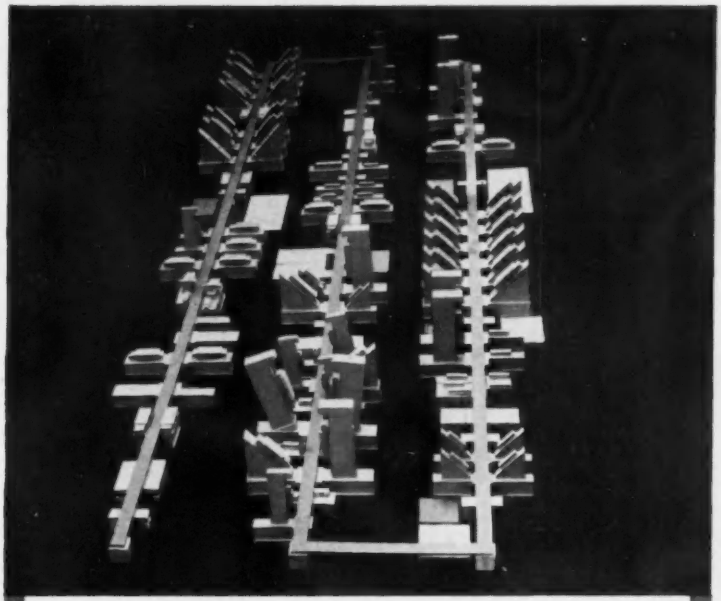
Gown by
Fon Tayne
reflected in
stainless by
Crucible
Steel
Company
of America
Stainless by
CRUCIBLE
where a fine finish is only the beginning



For economy, productivity, flexibility . . . EX-CELL-O BUILDING BLOCK UNITS!

- You get custom equipment, made from low-cost, standardized units.
- You can build simple one-way precision machines, or huge multi-station transfer machines.
- You can remove, relocate or add work stations to suit your production needs.
- You can arrange components for horizontal, angular, radial or vertical machining.
- You can partially or completely automate any sections.
- You can set up single or multiple functions—bore, counterbore, turn, drill, ream, face, chamfer and other operations.
- You can re-tool with standard Ex-Cell-O spindles, hydraulic power units and other accessories—and *know* all units will fit perfectly.
- You get faster delivery because standardization reduces engineering and build-up time.

If you're looking for manufacturing flexibility, look into Ex-Cell-O Building Blocks. Call your Ex-Cell-O Representative, or write for Bulletin 505911.

61-29M

EX-CELL-O FOR PRECISION

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(Advertisement)

RB&W FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

Technical-ities

by Fred E. Graves

Avoiding Bolt Failure Under Dynamic Loads

Dynamic loading in a tightened bolt may vary from no stress at all to that exceeding the bolt preload.

A classic example of dynamic loading is a connecting rod in a reciprocating engine. But you encounter such cyclic stress *wherever* you have fastened members that move or vibrate.

It has been shown that when the fluctuating stress approaches or exceeds actual bolt tension early fatigue failure can be expected.

DEMONSTRATION

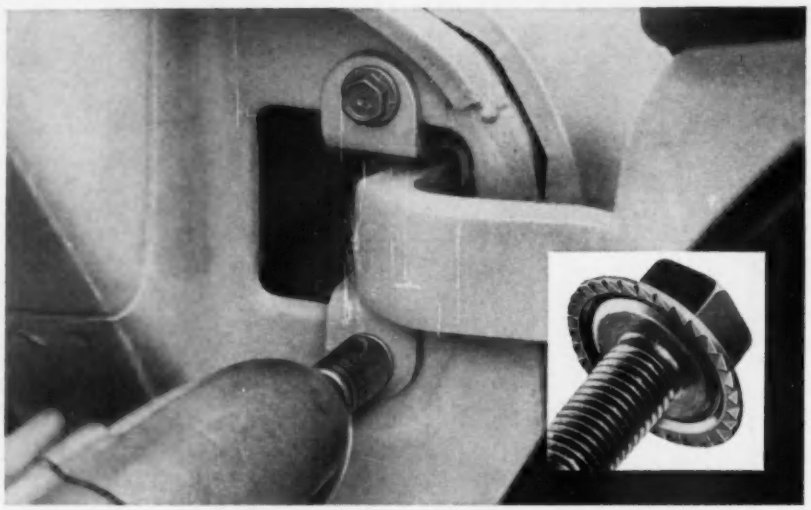
In tests, bolts tightened to a 1420 pound tension and stressed cyclically to 9215 pounds, failed after only 5960 cycles. Identical bolts tightened to 8420 pounds, and cyclically stressed to the same 9215 pounds, went 4.65 million cycles before failing.

Had the bolts been tightened to beyond the 9215 pounds, it would have been impractical to try to cycle them to failure.

So, if you want to avoid fatigue failure, be sure bolt tension exceeds the maximum dynamic load, known or estimated. This way, the bolt's life under dynamic loading will approach its life under static loading.

Take advantage of the high residual tension available to you in today's *high strength* bolts and screws, and thereby avoid fastener failures.

Why Tensilock® screws make ideal fasteners for "double-duty" jobs



TENSILOCK screws are engineered to prevent both *slippage* and *loosening*.

Heat-treated, they are so strong —even stronger in ultimate tensile strength than high-strength hex screws—that they can keep fastened members from slipping by high clamping force. As an added benefit, this permits more liberal tolerance in metalworking operations. Holes in fastened members can be oversize, slotted, eccentric, misaligned.

LOCKED-IN PLACE

Once they're tightened down, Tensilock screws can't shake or vibrate loose under reasonable service conditions. Sharp, angular, carburized teeth beneath their heads bite in to resist counter-clockwise loosening tendencies. To back off, 25% more off-torque is required than on-torque.

SAVES PARTS, TOO

Tensilock screws combine an integral washer with their self-locking feature for a unique one-piece fastener that speeds assembly.

Moreover, with their higher clamping force, it's possible that three Tensilock screws will do the job as well, or better, than four Grade 2 fasteners.

To take advantage of them, we suggest you call in an RB&W technical advisor. Or, write for Bulletin TL-2. Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N.Y.

Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional sales offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

Circle 116 on Inquiry Card for more data

Using basic components, seven different arrangements are possible, as shown above. Spindle drive motors can be mounted at right, left, or on both sides with single or double spindles; two machines can be placed side-by-side or used with other production machines.

The 4 BIG Features of Ex-Cell-O's New 411 Vertical Are Important To You

1. QUICK TOOL CHANGING—Tool changing and adjusting is fast and easy because of "clean" design and placement of the Model 411's components.

2. EASY PARTS HANDLING—Vertical construction lends itself to safe, easy loading and unloading of parts in a wide variety of shapes and sizes.

3. SINGLE COLUMN CONSTRUCTION—Solid base-column gives firm support to the hydraulically-operated compound tool slide. Rugged, simple construction assures maximum accuracy and efficiency, plus long life with lowest maintenance.

4. PRODUCTION VERSATILITY-The all-new Model 411 performs turning, boring, facing, grooving, limited contouring and chamfering operations singly or in combination. Often, both sides of disc-type parts can be machined simultaneously.

Contact your Ex-Cell-O Representative or write direct for details.

61-60M

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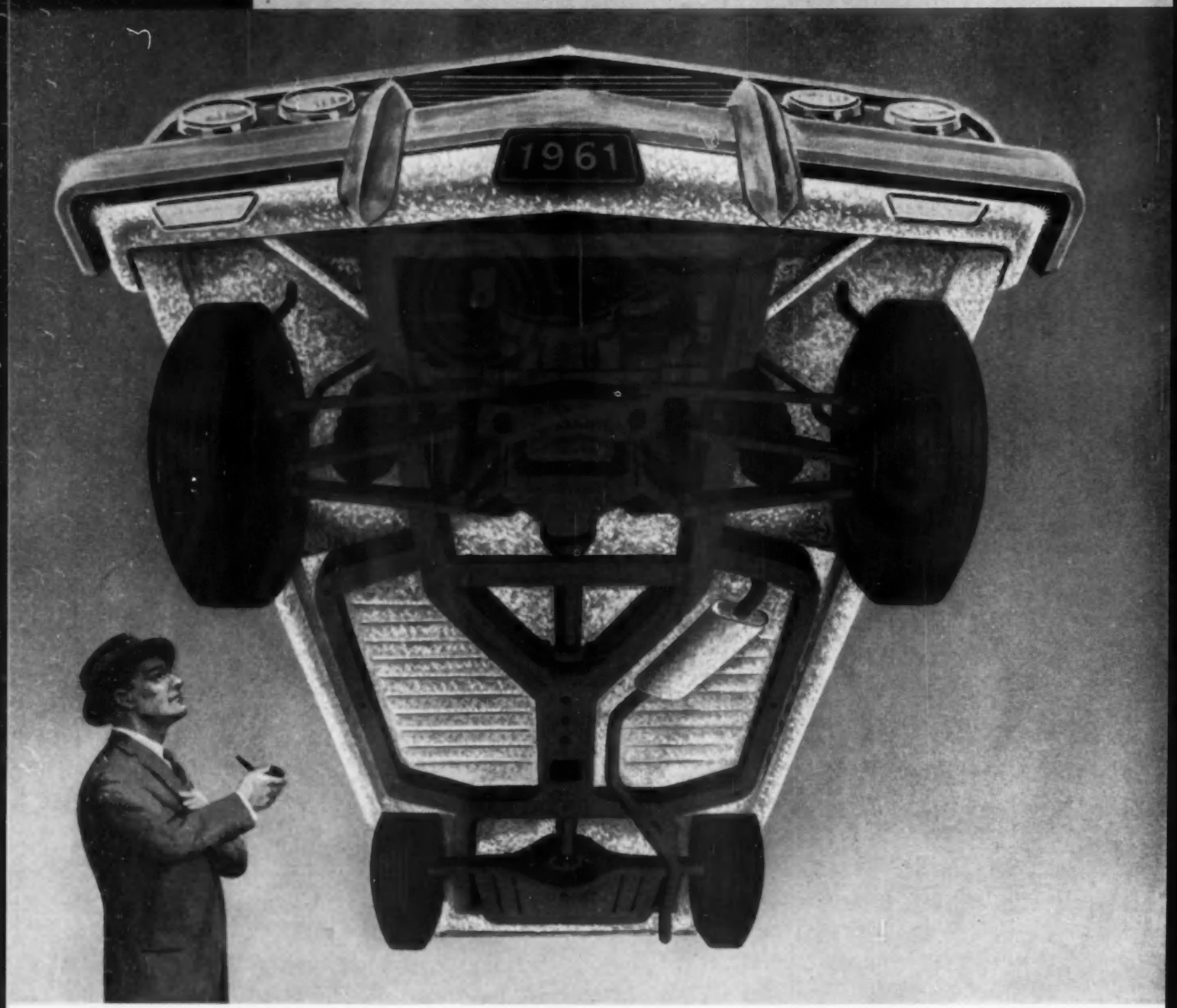
EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

Circle 117 on Inquiry Card for more data

Imagination in steel... by **Wheeling**



Does your car have the protection of galvanized steel?

Corrosion! It's always been one of your car's worst enemies!

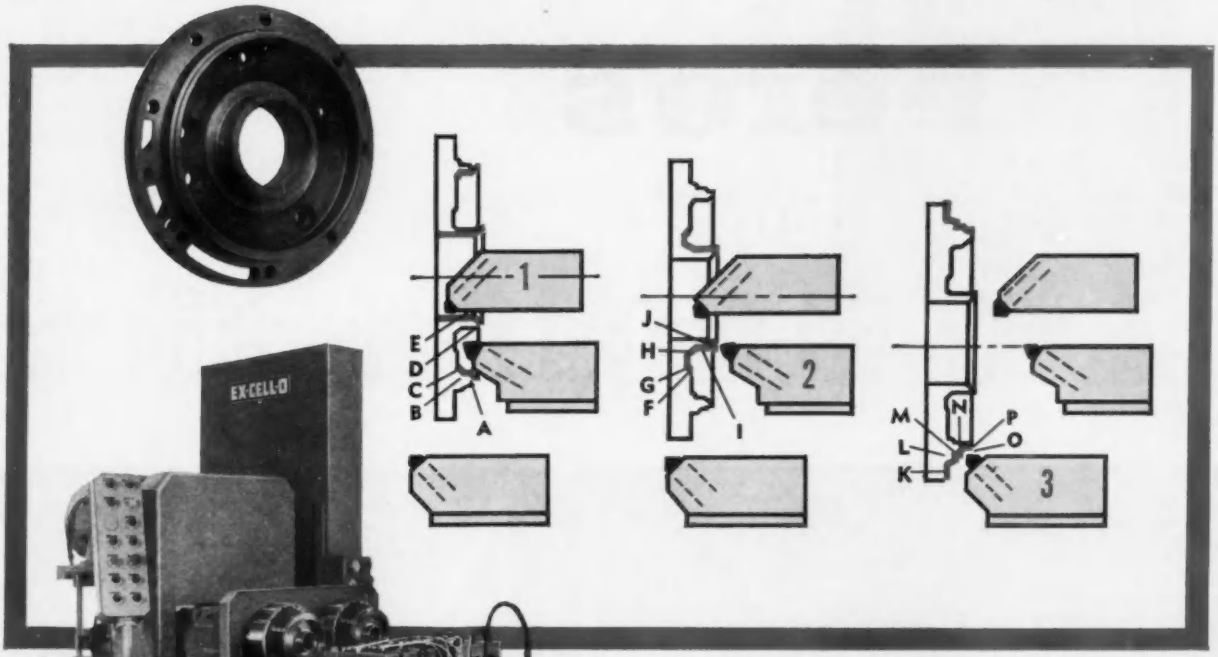
But now – thanks to a great forward step taken by the automotive industry – *cars are protected against corrosive conditions* encountered throughout the year.

Many new cars coming off the assembly line now feature underbodies made of tough, corrosion-resisting galvanized steel. SOFTITE® Galvanized Steel, originated by Wheeling Steel, is ideal for this use. SOFTITE's galvanized coating doesn't flake or peel. It's tough, dependable, long-lasting – under all types of corrosive conditions. That's why our challenge stands: *Anything that can be made of steel sheets can be made of Wheeling* SOFTITE *Galvanized Steel Sheets.*

Wheeling is proud to be supplying the automotive industry with both SOFTITE galvanized and regular sheet steels. We salute the industry's never-ending drive to give the world the greatest possible automotive values. Wheeling Steel Corporation, Wheeling, West Virginia.

IT'S WHEELING STEEL!

Ex-Cell-O Model 312 generates 21 surfaces per part!



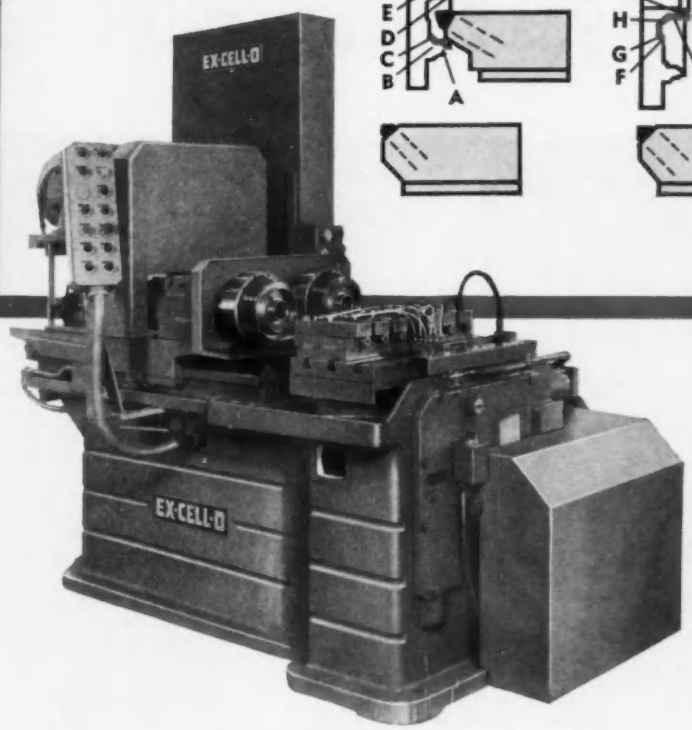


Diagram shows tools in quick-change magazines at the end of their strokes.

Tool No. 1 generates chamfer A, bores diameter B, generates radius C, traverses out, chamfers D and bores E.

Tool No. 2 generates surfaces F, G, H, I, and J with cam-controlled accuracy.

Tool No. 3 faces K, generates radius L, tapers M, turns N, chamfers O and generates radius P in cast-iron clutch assemblies.

Ex-Cell-O Cam-Operated Precision Boring Machines are designed especially for work requiring consistently precise boring, plunge-facing, grooving, chamfering and other O.D. and I.D. contours. Table and slide movements on hardened and ground ways are guaranteed by direct cam action—there are no levers, no complex linkages. For maximum accuracy, cams can be ground for you in our plant on numerically-controlled machines.

Two models, 308 and 312, rough, semifinish and finish a wide range of parts. Ask your Ex-Cell-O Representative for data, or write direct for details.

61-17M

EX-CELL-O FOR PRECISION

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Machinery Division

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

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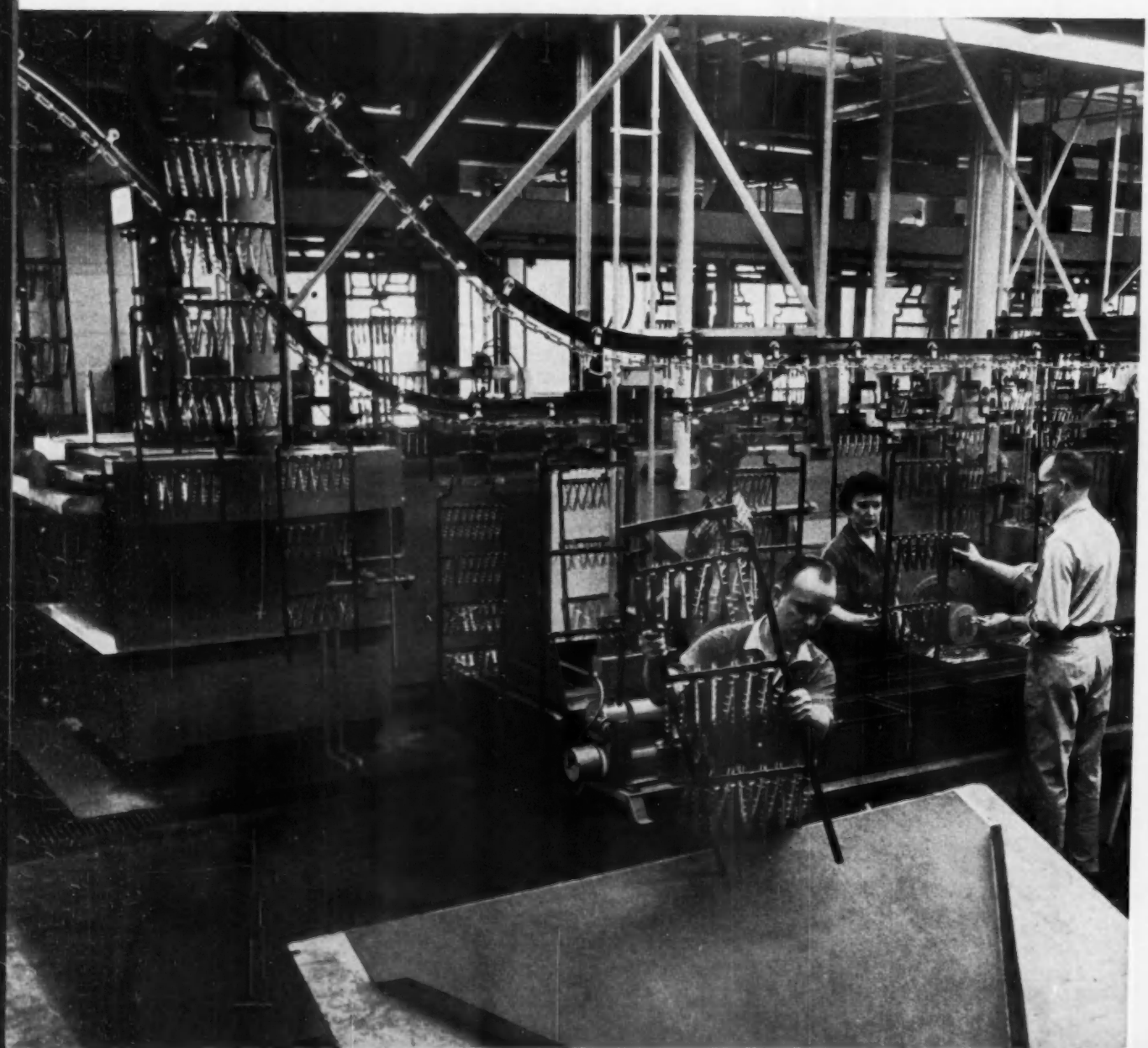
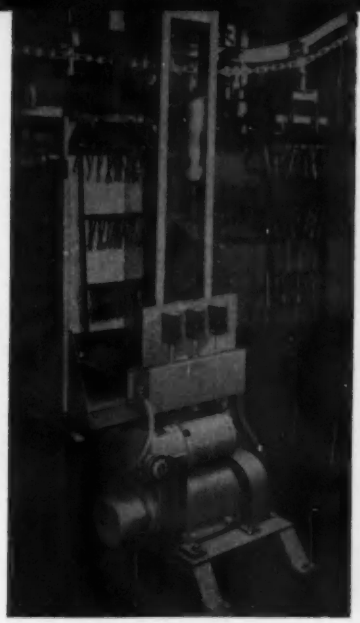
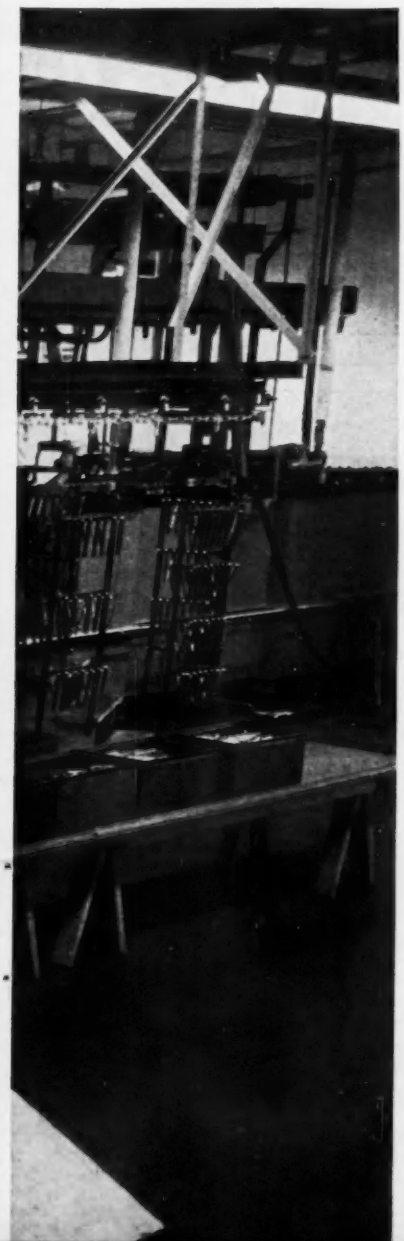
Circle 119 on Inquiry Card for more data

here's plating automation





at its best!



Udylite Cyclemaster ties into plant conveyor system, features automatic rack loading and unloading mechanism

A fully-automatic Udylite Cyclemaster was selected by Koelling Metal Parts, St. Louis, Missouri, to meet high-production, high-quality plating requirements on looseleaf binder and catalog components. This 15-station machine with automatic load and unload mechanism, shown above, is tied directly into a "stop and go" overhead plant conveyor system for maximum material flow efficiency. ■ This Udylite Cyclemaster provides peak production flexibility for Koelling. It operates at any rate from 40 to 120 racks per hour with plating thickness easily varied from .0001″ to .001″. Parts of any size can be plated within the limits of the 16″ x 8″ x 36″ racks. ■ The Cyclemaster maintains exacting quality control standards, boosts plating volume and offers an important reduction in floor space requirements. To find out how you can obtain the ultimate in automatic plating today at a surprisingly low cost, call your Udylite Representative and have him tell you the complete Cyclemaster story. Then, let Udylite Engineers recommend the specific machine and conveyor system to best meet your requirements.

Udylite

THE UDYLITE CORPORATION
DETROIT 11, MICHIGAN

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Now Danly engineering pierces more fender skirts with one!

It took three separate presses to pierce 62 mounting holes and shear pairs of inner fender skirts for a major automobile maker. Then Danly engineers were invited to cut costs. And they did! They designed this up-acting mechanical press with built-in hydraulic piercing units to do the job better and faster. It's engineered to turn out 600 fender skirts per hour—considerably more than the three presses it replaced! Much more economically, too, because it also eliminates two sets of complex cam type piercing units and the automation between the presses. Greatly reduces labor costs and floor space requirements, too.

The solution to this problem of how to accomplish these many operations on an irregularly-shaped piece of metal required broad experience in mechanical press, hydraulic press and hydraulic piercing equipment design—plus a good deal of imagination. This made the job a "natural" for Danly because, in each of these areas, Danly engineers are known to excel. Perhaps you, too, have a press problem that's a natural for Danly engineers. Shall we discuss it?

DANLY®

NEW ENGINEERING BULLETIN
—tells just what this mechanical-hydraulic press does—and how it does it. Write for your copy.

Mechanical Presses, Die Sets, Diemakers' Supplies, Hydraulic Metalworking Equipment

DANLY

DANLY MACHINE SPECIALTIES, INC., 2100 South Laramie Avenue, Chicago 50, Illinois

PLAN YOUR PRODUCTION AROUND

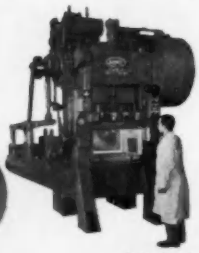
DANLY

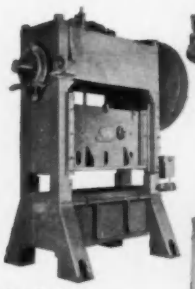
PRESSES

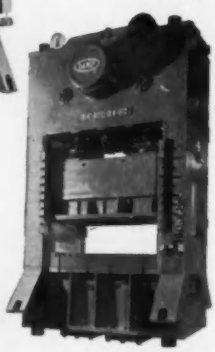
There's a type and size — 25 to 4000 tons — to meet your requirements for fast, economical production.

Open Back Inclinable

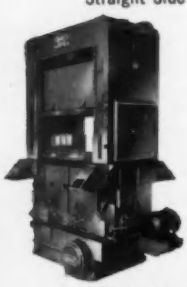
Hydraulic Platen Press


Autofeed


Single Action Straight Side Crankshaft


Single Action Straight Side

Double Action Straight Side


Underdrive

Forging Press

Quick Die Change Press

And each Danly press is easily adapted to your specific needs — or we'll build a special press to solve your special problems.

NEW PRINCIPLE IN TORQUE CONTROL LOWERS ASSEMBLY COSTS

Rotor announces J-42T torque control air impact wrench with new hydraulic amplifier

- **NEW** unique hydraulic amplifier shuts off tool at desired torque. This exclusive device results in...
- **FASTER** rundown and impacting speed. Cuts job time.
- **MORE ACCURATE** torque control with uniform results. Quick, easy adjustment...tamperproof.
- **ASK FOR DEMONSTRATION** of the J-42T to see how this outstanding development can cut costs on your assembly line.

Write The Rotor Tool Company, 26300 Lakeland Blvd., Cleveland 32, Ohio.

Here's the RIGHT TOOL for YOUR job!

ROTOR TOOLS®

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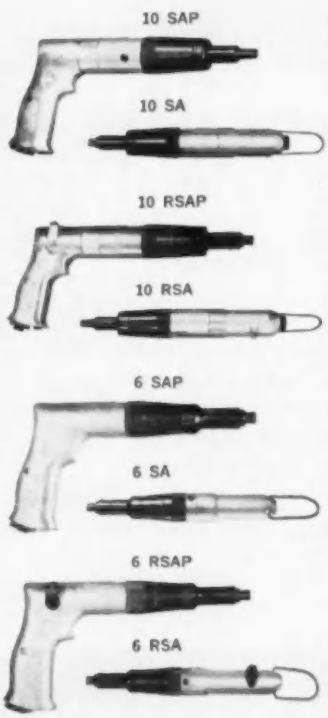
for the first time in air tool history Cleco offers--

EXCLUSIVE ONE YEAR WARRANTY

. . . on Clecomatic screwdrivers and nutrunners!

Trademark

New Cleco warranty—the first one year warranty ever offered —is effective now on CLECOMATIC Golden Circle Air Tools



Performance Superiority Leads to Warranty. Extensive tests and industry usage have proved that CLECOMATIC screwdrivers and nutrunners assure the operator of trouble-free performance in the most rigorous and exacting jobs. In view of these outstanding performance results, Cleco management and engineers offer this unprecedented one year warranty—fully confident that CLECOMATIC screwdrivers and nutrunners will continue to provide trouble-free operation for all industries.

Look For The Golden Circle. For quick identification of trouble-free CLECOMATIC screwdrivers and nutrunners, Cleco will designate these tools Golden Circle Air Tools, a new symbol for quality workmanship. At present, No. 6 and No. 10 Series CLECOMATIC non-angle head screwdrivers and nutrunners will carry the one year warranty of Golden Circle Air Tools.

CLECOMATIC screwdrivers and nutrunners included in this line are the No. 6 SA, 6 RSA, 6 SAP & 6 RSAP (in speeds of 1000, 2000 & 3000 rpm); and the No. 10 SA, 10 RSA, 10 SAP & 10 RSAP (in speeds of 500, 1000, 1500 & 3000 rpm).

What One Year Warranty Means. Cleco's exclusive one year warranty assures the buyer that Golden Circle Air Tools are guaranteed for one year from date of purchase to be free from defects in workmanship and material under normal operating conditions. Warranties are included with each product purchased. To redeem your warranty simply return the tool to your nearest Cleco division or branch office, or direct to the factory in Houston, Texas.

Why Is CLECOMATIC The Best? • Positive, completely automatic torque control. • Air is automatically turned on when work is engaged. • Air is automatically cut off at pre-set torque. • Lowest air consumption of any air tool of comparable size and capacity because motor can run only while on work. • Non-friction clutch and no-drift locking device maintains constant torque. • Practically no torque reaction. • Built-in automatic oiler on pistol grip handles.

Call your nearest Cleco office or representative for complete information. In your next air tool order, be sure to specify Clecomatic Golden Circle Air Tools.

CLECO AIR TOOLS

"quality tools engineered for industrial progress"

A Division of Reed Roller Bit Company • P. O. Box 2541/Houston 1, Texas, U. S. A.

IN CANADA: Cleco Pneumatic Tool Company of Canada, Ltd., 927 Millwood Road, Leaside (Toronto), Ontario

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Circle 124 on Inquiry Card for more data

a new ring development that promises major advancements through the magic of
MOLYBDENUM!

MOLY-FILLED

Cast Iron Compression Rings

A recent development of Ramco Engineering may soon obsolete many of today's compression rings. While still undergoing extensive testing in Ramco's laboratories, some of the findings are spectacular — particularly in friction reducing benefits.

Through a Ramco-developed process, the channeled face of a cast iron compression ring is filled with four to six thousandths of pure Molybdenum. The channeling leaves ten to twenty thousandths of cast iron at the top and bottom of the ring face. This means that the quick-seating qualities of cast iron are available and that the long wear characteristics of Molybdenum come into play for extra long life.

The Moly-Filled Ring is but one of the many new advances in ring design we'd like to show you. There are others equally interesting. A phone call or letter will put the facts on your desk.

***Piston Rings by* THOMPSON PRODUCTS RAMCO DIVISION**

Thompson Ramo Wooldridge Inc. • P. O. Box 513
Dept. H, St. Louis 66, Mo.

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EF

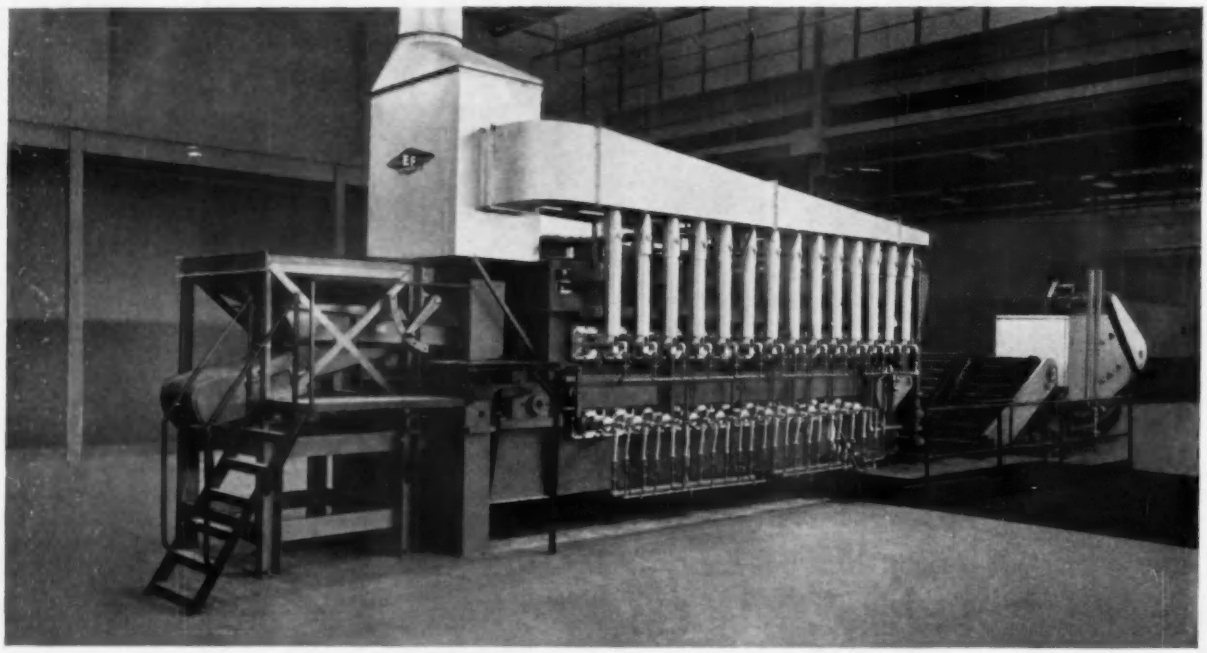
Chain Belt Furnaces

for scale-free hardening, carbon restoration, carburizing, carbon nitriding or non-decarb heat treating of small and medium size parts.

EF Chain Belt Conveyor Furnaces are ideally suited for processing a wide variety of products in a wide range of atmospheres. Their initial cost is moderate. Operation is almost completely automatic, minimizing labor costs. The material is carried directly on the belt without shaking or jarring. No pans or trays are needed, thus avoiding the necessity of heating this additional weight, and assuring high fuel economy.

Available in electrically heated or fuel fired designs. 15 standardized sizes with capacities from 175 to 3000 lbs. per hour, minimize the charges for new engineering and assure prompt delivery. Easily installed. Often shipped completely assembled requiring only connection to utilities. 7 out of every 10 new orders are from previous users attesting the serviceability and dependability of our design.

Write for Bulletin No. 601. It gives full details . . . and call the EF engineers on every heat treating project. Our long experience and extensive research and development facilities can shorten your path to low cost, profitable operation.



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GAS • OIL • ELECTRIC

THE ELECTRIC FURNACE CO.

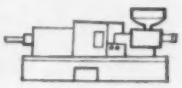
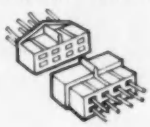
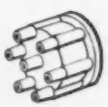
Fuel Fired and Electrically Heated
HEAT TREATING FURNACES
for Processing any Product, in any Atmosphere, any Hourly Output Required

Salem - Ohio

SUBSIDIARIES—Turnkey Engineering Co., Inc., South Gate, Cal. • Canefco Limited, Scarborough, Ontario
SALES REPRESENTATIVES—2842 West Grand Blvd., Detroit 2, Mich. • also 968 Coleman Rd., Cheshire, Conn.

Circle 125 on Inquiry Card for more data

What's News In Plastics...

Escon® polypropylene offers molders  a balanced combination of properties for a wide range of molding applications such as high strength and impact resistance in automobile dash boards ...excellent electrical properties for cable connectors  ...high heat distortion temperature in vaporizers ...low water pick-up in distributor caps  ... outstanding dynamic fatigue resistance for "living hinge" in accelerator pedals and snap-fit closures for containers...outstanding chemical resistance plus high gloss, surface hardness, and quality "feel" in dinnerware . All available for volume production at low cost.

The list of products made with Escon polypropylene is growing every day. Try this versatile molding material for your product. For full information write to Enjay, 15 West 51st Street, New York 19, N. Y.

EXCITING NEW PRODUCTS THROUGH PETRO-CHEMISTRY

ENJAY CHEMICAL COMPANY

A DIVISION OF HUMBLE OIL & REFINING COMPANY

ENJAY

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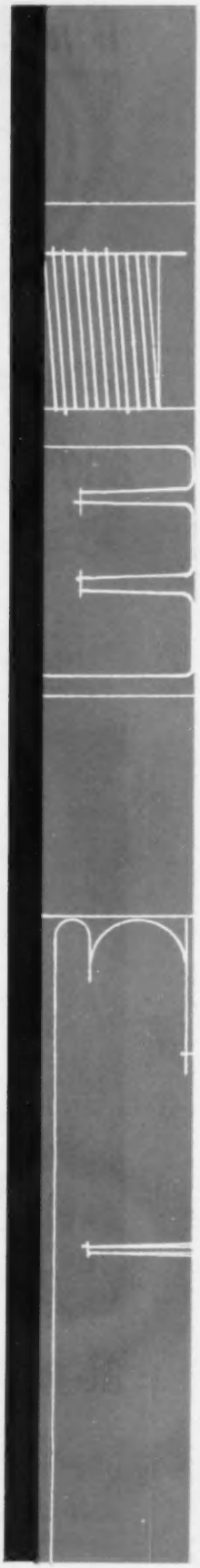
NEW!

OILITE®

CYLINDER LINERS



- **Eliminate machining costs . . . reduce ring wear . . . cut oil consumption 66⅔%.**
- **Approved by leading manufacturers of both 2 cycle and 4 cycle engines after numerous 500 hour, full throttle tests.**

OILITE CYLINDER LINERS represent 3½ years of intensive engineering development work by the Amplex Division, Chrysler Corporation. The final break-through came less than a year ago with the successful formation of a new OILITE alloy (W-982). Now, thousands of test hours later, three conclusive facts are clear:

1. **OILITE CYLINDER LINERS** reduce oil consumption by as much as 66⅔%—and contribute to longer engine life.
2. **OILITE CYLINDER LINERS** reduce piston ring wear dramatically. For example, after a 500 hour test at full throttle, the machining marks on the rings are still clearly visible.
3. **OILITE CYLINDER LINERS** are produced as a precision part that may require only honing; therefore, a significant saving can usually be realized—especially in smaller horsepower range engines.

If you manufacture any type of internal combustion engine it will pay you to investigate OILITE CYLINDER LINERS immediately.

Reg. Trade Mark

AMPLEX
DIVISION CHRYSLER CORPORATION, DETROIT 31, MICH.

A CHRYSLER **OILITE** PRODUCT

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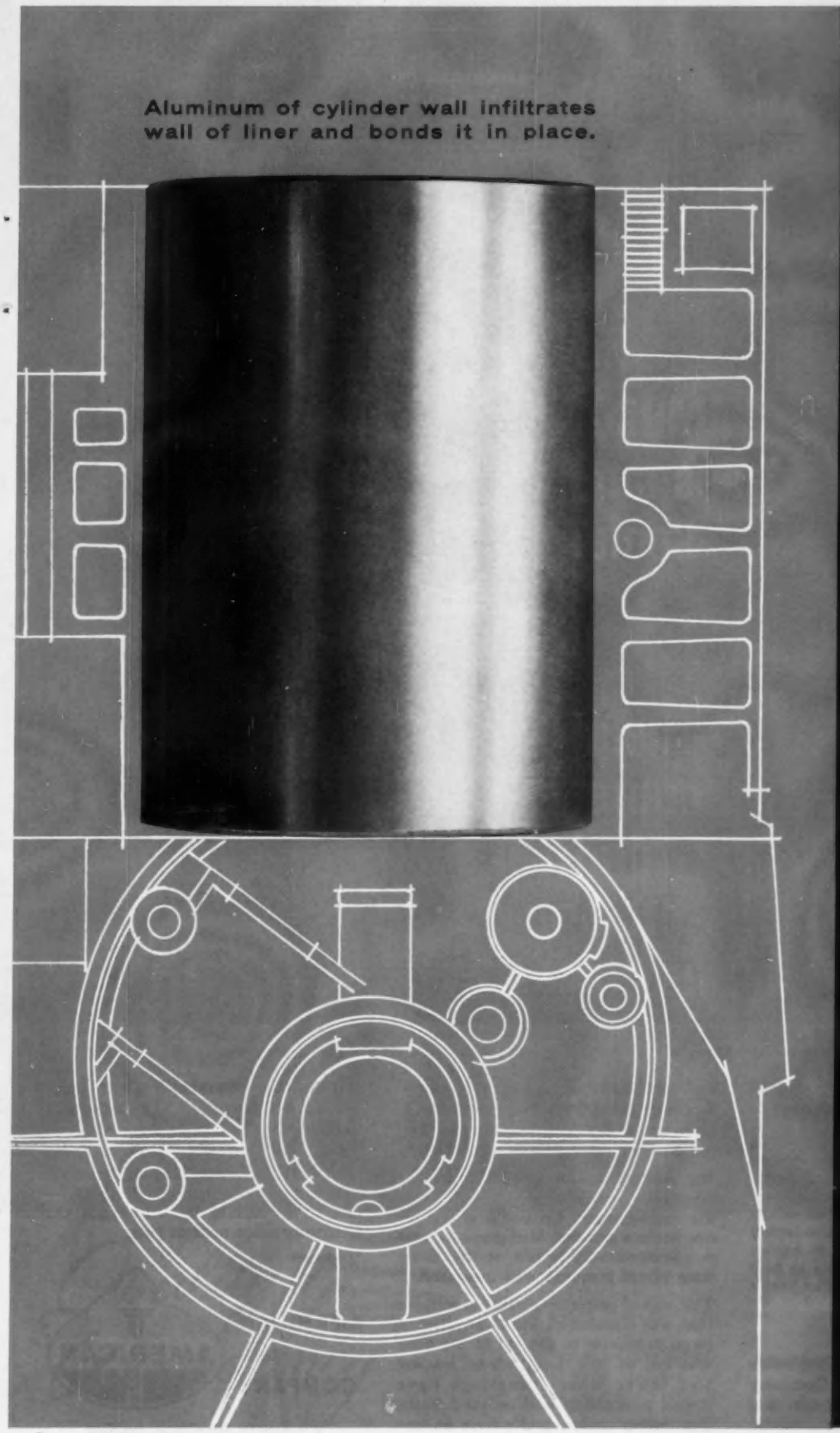
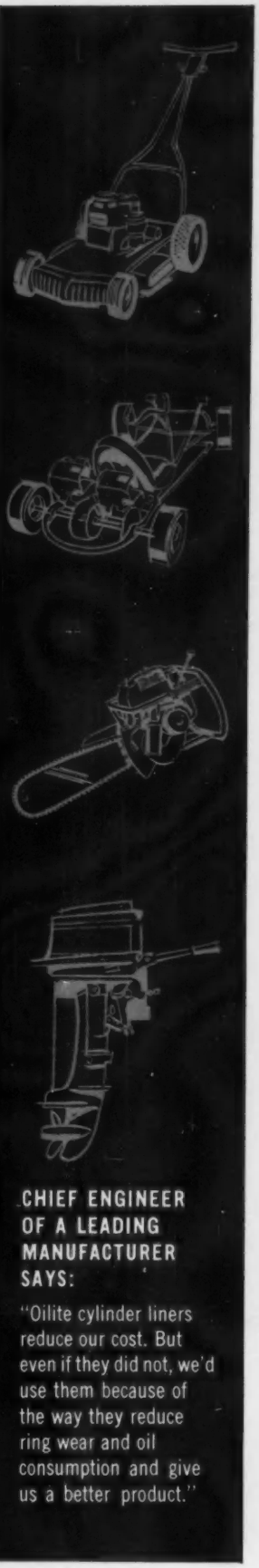




CHIEF ENGINEER OF A LEADING MANUFACTURER SAYS:

"Oilite cylinder liners reduce our cost. But even if they did not, we'd use them because of the way they reduce ring wear and oil consumption and give us a better product."

Circle 128 on Inquiry Card for more data➔

Eliminate reworking because of rust, reduce wheel loading and extend intervals between wheel dressings; do these and you increase profit per unit, explains Detroit Edge Tool president, Dan Ebbing, to P. E. "Pappy" Stratton of American Oil. Sam Vineh, operator, looks on.

by PAUL E. "PAPPY" STRATTON

About the Author.

"Pappy" Stratton has been providing technical help on lubrication and metalworking problems to customers in the Detroit area for nearly all of the twenty-five years he has been working for the company. In addition to having this store of practical experience to help him, Pappy has completed the Company's Sales Engineering School.

☆ ☆ ☆

By using a soap-base grinding compound, Detroit Edge Tool Company was getting excessive corrosion and rust on work and grinding machines. Oil vapor was collecting on machines and on the ceiling, causing dirty working conditions. Most important, high wheel loading was causing frequent down-time for wheel dressings.

We worked out a test program on AMOCOOL Transparent Coolant with the management. On our first test on one surface grinder, feed pressure was cut substantially while at the same time metal removal was increased.

The cost of reworking parts to remove rust was eliminated. Time required to clean machines to get rid of the odor was cut in half. Less wheel loading and fewer wheel dressings have upped production and reduced costs. Our test program paid out in an improved profit picture. All grinding and drilling equipment has been converted to AMOCOOL Transparent Coolant.

☆ ☆ ☆

Would you like this kind of technical help to assist you in improving profits? Get it by calling the American Oil Company office nearest you.

*Trademark

AMERICAN OIL COMPANY

AMERICAN

910 SOUTH MICHIGAN AVENUE
CHICAGO 80, ILLINOIS

Quality in Ascendancy

The superiority of the vast number of products that are — and can be made from Roebling Cold Rolled Flat Spring Steel is a fact known throughout all industry.

You pay for mechanical and dimensional uniformity when you buy flat spring steel . . . you get it when you buy Roebling.

For information on how our products can help yours, write Roebling's, Wire and Cold Rolled Steel Products Division, Trenton 2, New Jersey.

ROEBLING

Branch Offices in Principal Cities
John A. Roebling's Sons Division
The Colorado Fuel and Iron Corporation

Roebling... Your Product is Better for it

HOUGHTON MACHINING COOLANTS

A new advance in synthetic coolants

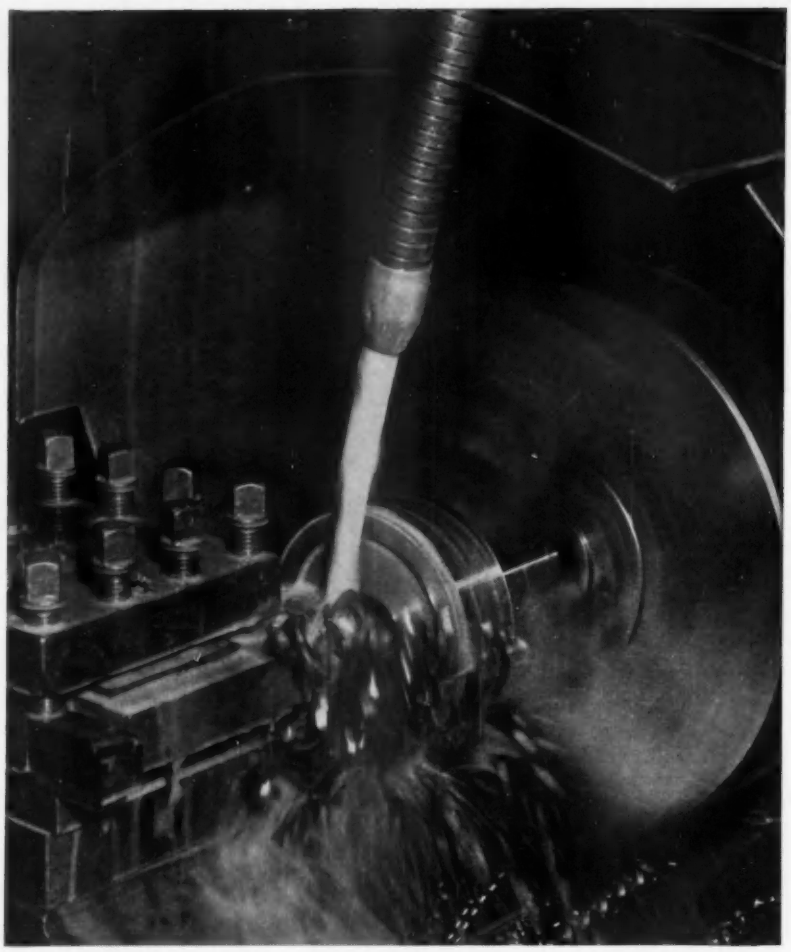
The first chemical coolants were outstanding in controlling rust and rancidity. They have done a good job and are widely accepted for many metal removal operations.

Because they were not heavy-duty fluids, our research department continued its search for a chemically-conceived coolant that could take the place of highly fortified straight oils. The result is new Hocut 3210—a significant advancement in the science of machining coolants.

Hocut 3210 is a highly fortified water-soluble concentrate. It has outstanding anti-weld and extreme pressure characteristics. As a result, it does better those jobs previously reserved for fortified straight oils. Hocut 3210 improves finish at higher speeds without sacrificing tool life. Additionally, it eliminates smoke, oil fog and inherent fire hazards.

Hocut 3210's E.P. characteristics are released by the heat of the cutting operation. This forms a barrier between the tool and the work resulting in a clean cut, free from any welding of chip to tool. Tool life is increased, surface finish improved and parts come off the machine cool enough to handle.

Its heavy duty ability makes it an ideal coolant for tough jobs such as tapping, broaching, form grinding, internal and external thread cutting, thread rolling, plunge grinding, etc.



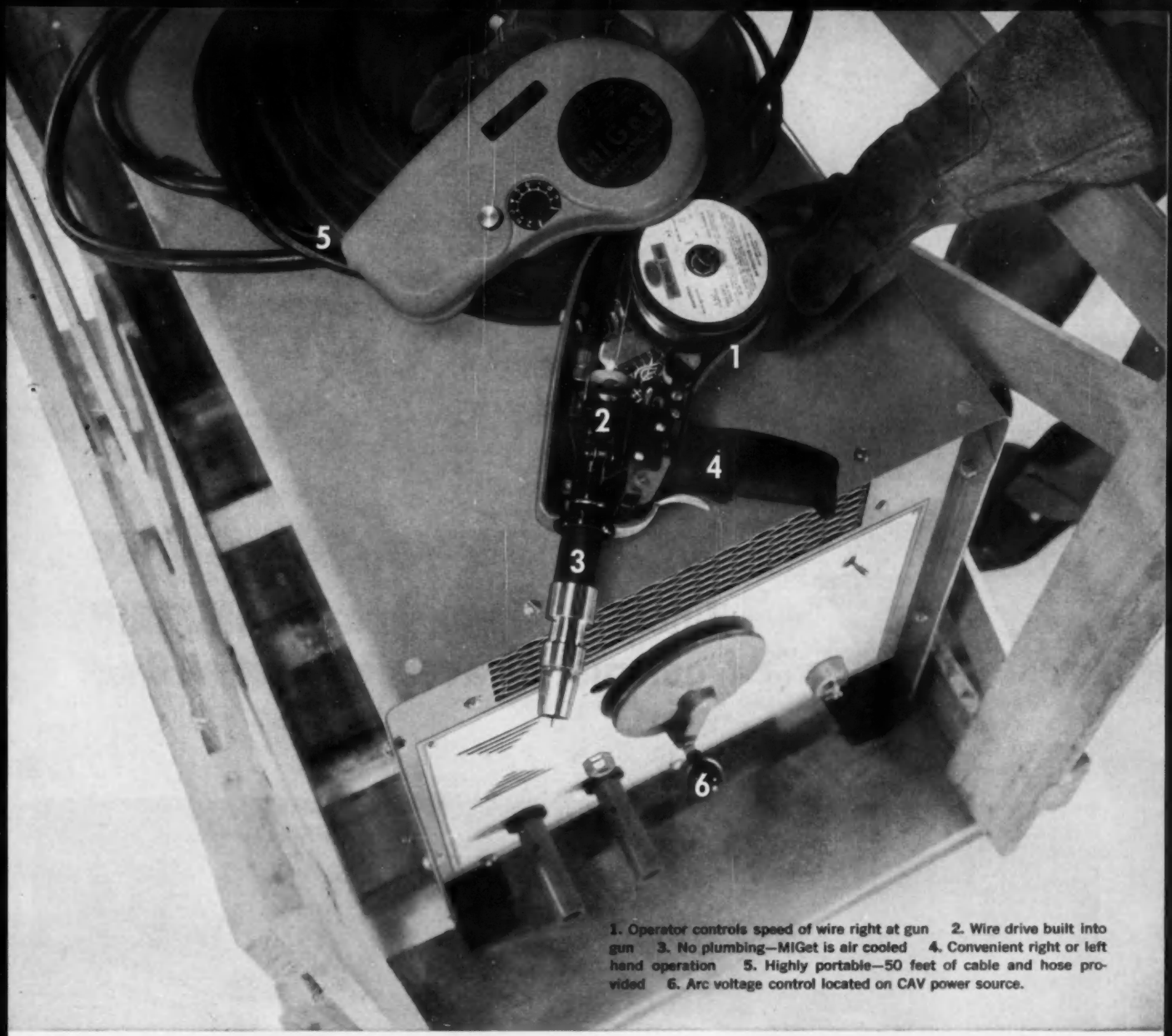
In spite of all the outstanding features and capabilities of Hocut 3210, its cost is most reasonable. To be up to date on this latest coolant advance, write for complete data or ask your nearby Houghton Man for a test in one of your tough jobs. E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

Houghton

INDUSTRY'S PARTNER IN PRODUCTION

Circle 130 on Inquiry Card for more data

← Circle 129 on Inquiry Card for more data



1. Operator controls speed of wire right at gun 2. Wire drive built into gun 3. No plumbing—MIGet is air cooled 4. Convenient right or left hand operation 5. Highly portable—50 feet of cable and hose provided 6. Arc voltage control located on CAV power source.

DO HI-SPEED AIRCOMATIC WELDING ANYWHERE—$995*

with new MIGet UNIT PACKAGE! (no separate control needed) only

Airco now gives you the simplest, lowest price gas-shielded metal-arc welding package in the industry —

(1) Hi-speed highly portable MIGet welding gun, with handy knob to adjust wire feed speed; model AH20-E.

(2) New Aircomatic MIGet CAV power source, with control to adjust arc voltage.

The new MIGet UNIT PACKAGE enables you to make numerous short-length welds . . . at a remarkably low cost. You can work up to 50 feet from the power source, on anything from radar antennas to crawl-in tunnels.

You can weld mild steel with Dip Transfer using CO_2 or AG25; aluminum with Spray Transfer or Dip Transfer using argon; stainless steel with Dip Transfer using AG1.

The MIGet gun connects directly to the power source. It weighs only 2¾ pounds. Handles .030" and 3/64" aluminum wires, and .030", .035" and .045" hard wires. It is rated at 200 amperes 100% duty cycle.

The power source, in which the "welding current takes care of itself," is a single phase, DC rectifier, CAV type, rated at 200 amperes 60% duty cycle. Reactance for Dip Transfer is built in.

Here is Aircomatic-quality gas shielded metal arc welding at an unmatched low price of $995!*

Airco — and only Airco — makes everything you need for any kind of welding. Call your nearest Airco office or Authorized Airco Distributor. Look in your Classified Telephone Directory under "Welding Equipment and Supplies" for your nearest Airco representative.

*Zone I price. Zone II price—$1015.00

AIRCO® **AIR REDUCTION SALES COMPANY**

A division of Air Reduction Company, Incorporated
150 East 42nd Street, New York 17, N. Y.
More than 700 Authorized Airco Distributors Coast to Coast

On the west coast—Air Reduction Pacific Co., Internationally—Airco Co. Int'l., In Canada—Air Reduction Canada Ltd. • All divisions or subsidiaries of Air Reduction Co., Inc.

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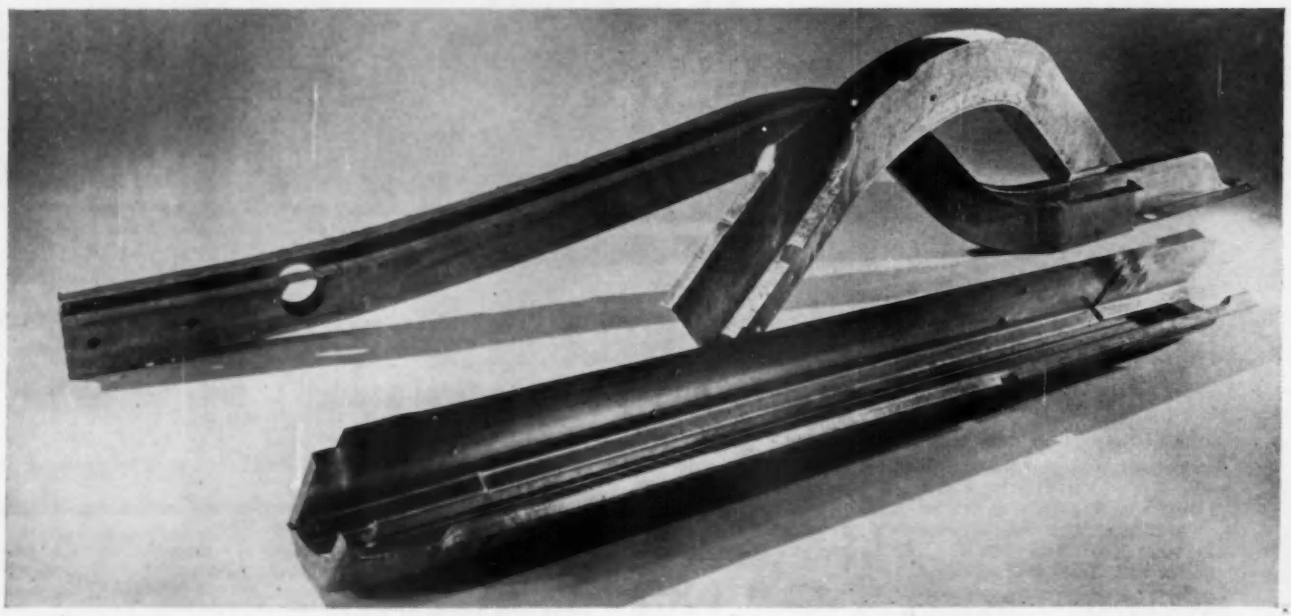
New steels are born at Armco

CAN YOU MATCH THIS WITH

Zinc Coating on Armco ZINCGRIP from rust at average cost of 2⅓¢



Galvanized Steel

Use this label to identify your products made of strong, durable steel

PAINTING OR PLATING?

gives parts protection per square foot

Check these typical cost comparisons

Steel thickness	Cost of* ZINCGRIP Coating ¢/sq. ft. of sheet	Typical** Cost of Painting ¢/sq. ft. of sheet	Savings with ZINCGRIP ¢/sq. ft.
.025	1.83¢	3.25¢	1.42¢
.050	2.72	3.25	.53
.075	2.51	3.25	.74
Average	2.35¢	3.25¢	.90¢

*Coated both sides **Painted both sides

Computations based on coils 24" to 36" wide. ZINCGRIP coating costs are additional costs beyond price of cold-rolled steel. Paint costs are figured on typical dip-painting or flow-coating methods and include costs of metal preparation, paint, labor and overhead of painting operations. Some paint costs may be lower than these; many are higher.

A manufacturer of small automotive stampings saved 2.8¢ per piece by using Armco ZINCGRIP® and eliminating cadmium plating. Another manufacturer reported savings of $6.34 per ton by using ZINCGRIP for bus floors in place of hot-rolled steel, bonderized and prime-coat painted. Besides initial savings, ZINCGRIP provides a two-side full-weight coating of zinc for superior protection against corrosion. It's exceptionally workable, too. Base metal and zinc coating hold up under severe fabrication.

Founder of versatile "family"

ZINCGRIP was first in a series of specialized Armco hot-dip zinc-coated steels. They're produced with normal spangles or spangle-free, differentially coated for painting on one side, or if specified, mill-treated for immediate painting after fabrication.

Let us work with you in comparing costs for painted or plated parts with costs for the same parts made of Armco ZINCGRIP — or one of its zinc-coated "family."

Just fill in and mail the coupon.

Armco Division
Armco Steel Corporation
2491 Curtis Street, Middletown, Ohio

☐ Send me your bulletin, **Economy of Armco ZINCGRIP for Hidden Structural Parts**

☐ Have an Armco representative call

NAME_____ TITLE_____

FIRM_____

STREET_____

CITY_____ ZONE____ STATE_____

ARMCO **Armco Division**

Circle 132 on Inquiry Card for more data

They "Go Together" For

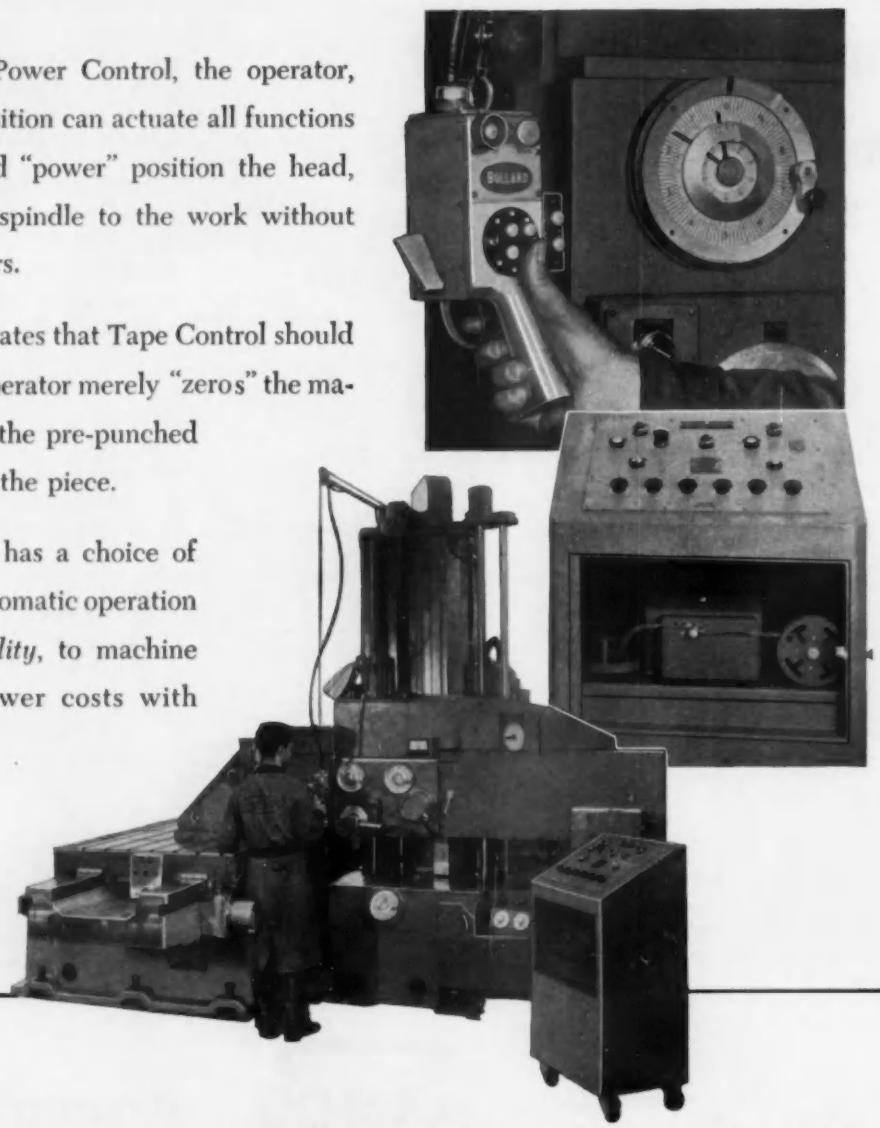
CENTRALIZED POWER CONTROL for manual operation and **NUMERICAL TAPE CONTROL** for automatic operation provide complete versatility of the Bullard DYNAMILL H.B.M. to insure maximum production.

Complete Versatility

With Centralized Power Control, the operator, from his normal position can actuate all functions of the machine and "power" position the head, table, saddle, and spindle to the work without hand cranks or levers.

When the work dictates that Tape Control should be employed, the operator merely "zeros" the machine according to the pre-punched tape for machining the piece.

Thus, the operator has a choice of either manual or automatic operation — *complete versatility*, to machine more pieces at lower costs with increased profits.



BULLARD

For Complete Information on the Bullard DYNAMILL H.B.M., call your nearest Bullard Sales Office or Distributor or write The Bullard Company, Bridgeport 9, Connecticut.

KNOW YOUR ALLOY STEELS . . .

This is one of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many who may find it useful to review fundamentals from time to time.

Steel

for Strength . . . Economy . . . Versatility

Tests for Determining Mechanical Properties of Alloy Steels

The types of tests used to evaluate the mechanical properties of an alloy steel depend upon the end use of the steel involved. Mechanical properties are determined usually by tension, bend, and hardness tests, and by a group of special tests employed on tubular and wire products.

(1) *Tension tests* provide means of determining tensile strength, yield point, yield strength, proof stress, proportional limit, per cent elongation, and per cent reduction of area. This sort of test subjects the steel to stresses resulting from the application of an axial tensile load to the specimen ends, the load being sufficient to rupture the specimen.

(2) *Bend tests* often aid in determining the ductility of steel. The severity of such a test depends largely upon the bending radius used. Several factors influence the length of radius, including thickness of the test specimen, width of test specimen, direction of test, chemical composition, tensile strength of specimen, etc.

(3) *Hardness tests* determine the steel's resistance to penetration. This characteristic is most commonly measured by the Brinell Test or the Rockwell Test. In the former, pressure is applied to the surface of a test specimen by means of a ball 10 mm in diameter. Two diameters of the resulting impression are measured and averaged; the average is converted to the hardness number by means of a conversion table. In the Rockwell Test, the degree of hardness is read on a gage; hardness is measured by the penetration of a diamond point or a 1/16-in. steel ball. Rockwell "C" scale readings are used in connection with the diamond point; "B" scale in connection with the steel ball. The "C" and "B" are the most commonly used of the several Rockwell scales.

(4) *Special additional tests* are often made on tubular and wire products. These include such items as hydrostatic and manipulating tests, and torsion and wrapping tests, the latter two being used only with wire.

The subject of testing and its relationships to the end uses of alloy steels has been given broad study by Bethlehem metallurgists. If you desire, they will be glad to discuss any phase of it with you, and also give unbiased opinions on such matters as analysis, proper selection of steels, machinability, etc. Call for their services at any time.

And when you need alloy steels, remember that Bethlehem furnishes the entire range of AISI standard analyses, as well as special-analysis steels and all carbon grades.

This series of alloy steel advertisements is now available as a compact booklet, "Quick Facts about Alloy Steels." If you would like a free copy, please address your request to Publications Department, Bethlehem Steel Company, Bethlehem, Pa.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA. *Export Sales:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

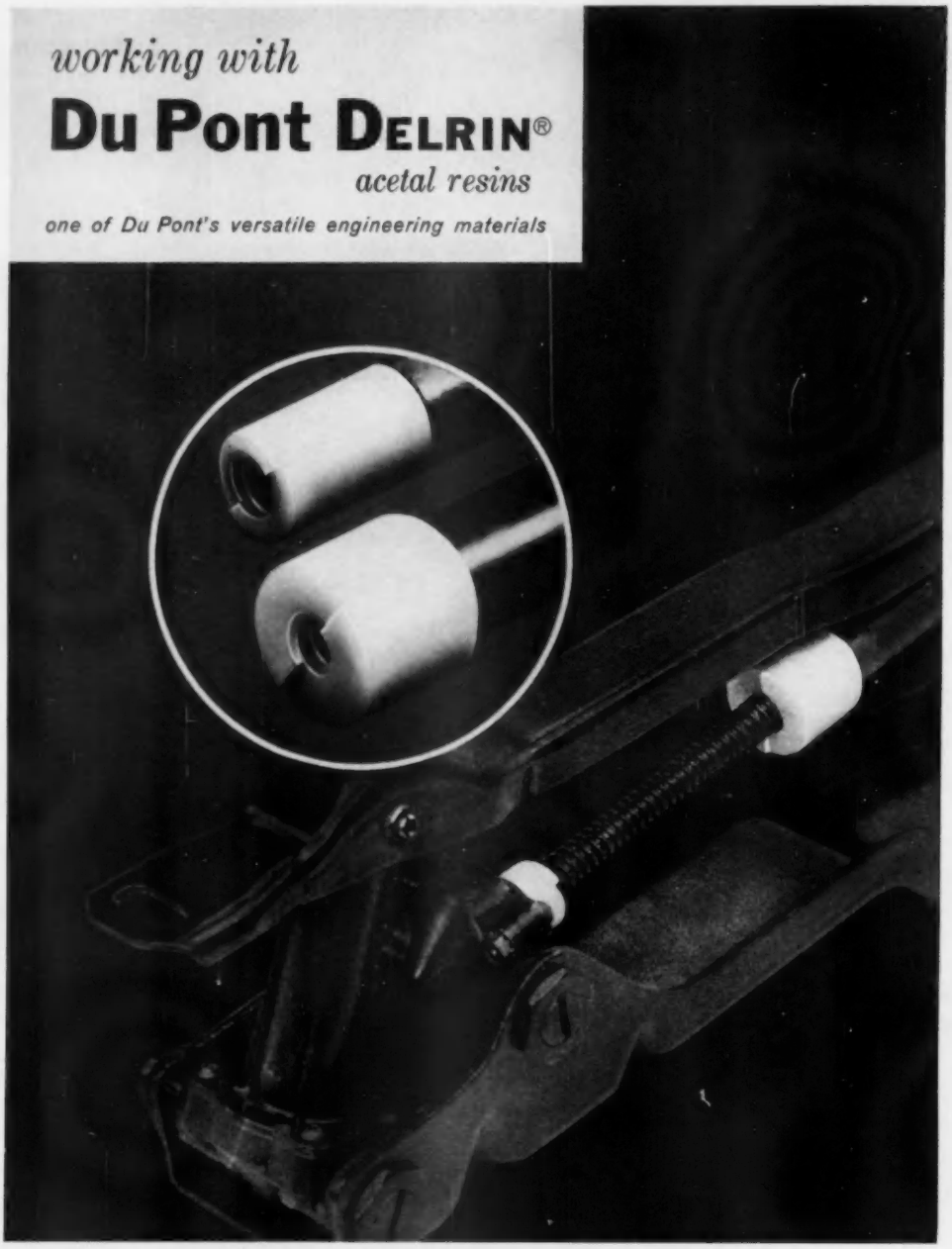
Circle 134 on Inquiry Card for more data

working with

Du Pont DELRIN®

acetal resins

one of Du Pont's versatile engineering materials

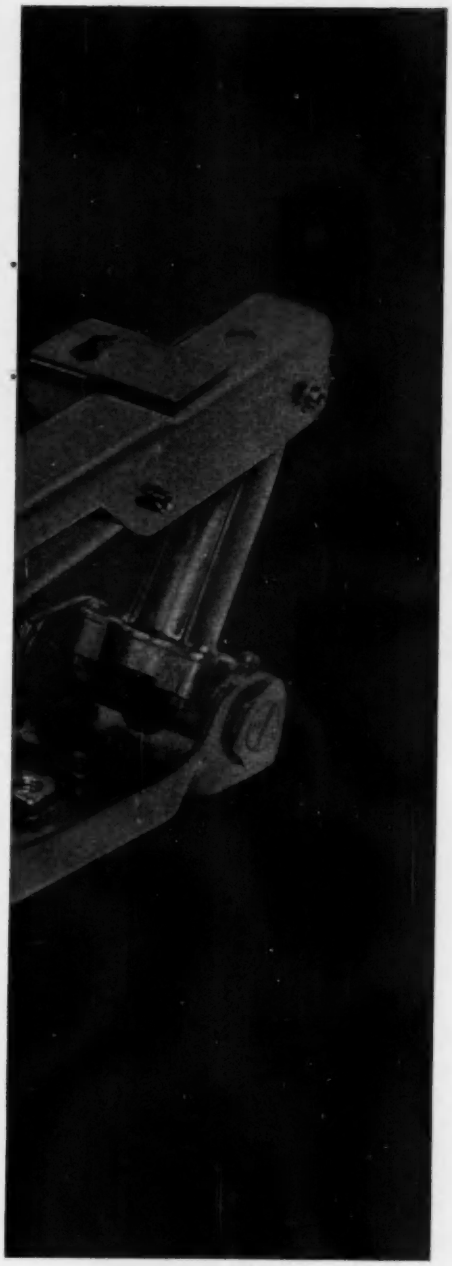


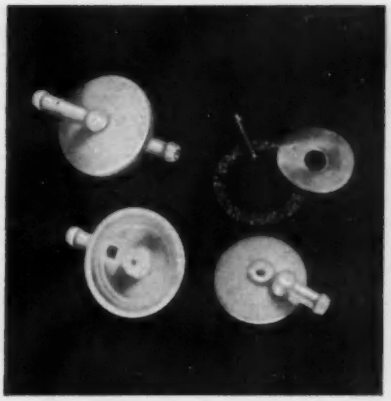
Now parts of DELRIN® cut costs and improve operation of new power seats

Shown above is part of a new six-way power-seat adjusting mechanism used in a luxury automobile. To move the seat, power-driven screws turn inside nuts (shown in circle and at upper end of screw) molded of Du Pont DELRIN acetal resin. The nuts are attached to seat members, causing the seat to move up or down, forward or back. The high strength of DELRIN, its low coefficient of friction, and its dimensional stability under varying conditions of temperature and humidity assure smooth, accurate and quiet operation. Economical injection molding of the nut in DELRIN results in a substantial cost reduction as against fabrication of the part in steel.

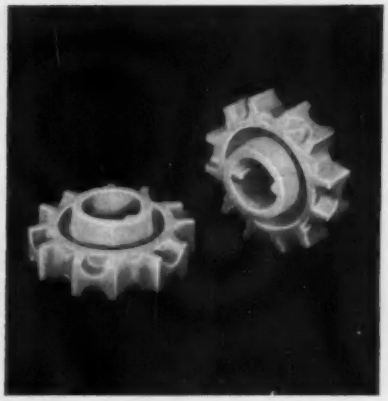
In the complete mechanism, transmission gears and electrical coil bobbins are molded of tough Du Pont ZYTEL® nylon resins, and liners (tubing) of Du Pont ALATHON® polyethylene resin are used to eliminate metal-to-metal noises. Stop nuts (at lower end of screw) are also molded of ZYTEL.

Design and manufacture of the completed unit are by Ferro Stamping Company, Detroit, Michigan. Nuts of DELRIN molded by Sun Plastics, Inc., Cayuhoga, Ohio, and Molmec, Inc., Walled Lake, Mich.; gears by W-L Molding Co., Kalamazoo, Mich.; tubing of ALATHON by Lus-Trus Corp., Ypsilanti, Mich.; and stop nuts of ZYTEL by Molmec, Inc.





This simple but efficient fuel filter for small gasoline engines is made with filter and gasket seated in a tough, stiff part of DELRIN and a cover of ZYTEL which flexes and seats firmly on the gasket. The use of these Du Pont engineering materials eliminates finishing operations, provides lower assembly and shipping costs. (By Hoffman Industries, Spring Arbor, Mich., for Tillotson Mfg. Co., Toledo, O.)



Key unit of a new corn planter is this sprocket, molded of DELRIN, which slides along a grooved shaft. Cast iron formerly used tended to stick, corrode and erode. The natural lubricity and corrosion and abrasion resistance of DELRIN provide longer life for the sprockets . . . lower finished-part cost. (Molded by Rockford Molded Products, Rockford, Ill., for John Deere Planter Works, Moline, Ill.)

DELRIN® makes possible improved design in increasing variety of auto components

In automotive design applications ranging from door handles to instrument housings, from lamp sockets to lubrication-system components, the unique combination of important engineering properties of DELRIN acetal resin is being put to good use. DELRIN offers designers a material with high fatigue-endurance limit, high stiffness, high strength, good resistance to creep, good toughness and good resilience—all over a wide range of temperatures and environments. It has good abrasion resistance, excellent resistance to solvents and oils, good frictional properties. And it offers the economies of injection molding plus the virtual elimination of costly finishing operations. For more information about Du Pont DELRIN acetal resin that will help you evaluate this remarkable new engineering material for *your* applications, mail the coupon below.

POLYCHEMICALS DEPARTMENT

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING. . . *THROUGH CHEMISTRY*

DELRIN® *acetal resins*

one of Du Pont's versatile engineering materials

Alathon® polyethylene resins · **Lucite®** acrylic resins · **Zytel®** nylon resins

E. I. du Pont de Nemours & Co. (Inc.), Dept. AI-91
Room 2507D, Nemours Bldg., Wilmington 98, Del.
Please send me information on the following:

☐ DELRIN® ☐ ALATHON® ☐ LUCITE® ☐ ZYTEL®

Name_____

Company_____ Position_____

Street_____

City_____ Zone_____ State_____

In Canada: Du Pont of Canada Limited, P. O. Box 660, Montreal, Quebec.

GN

Pedrick

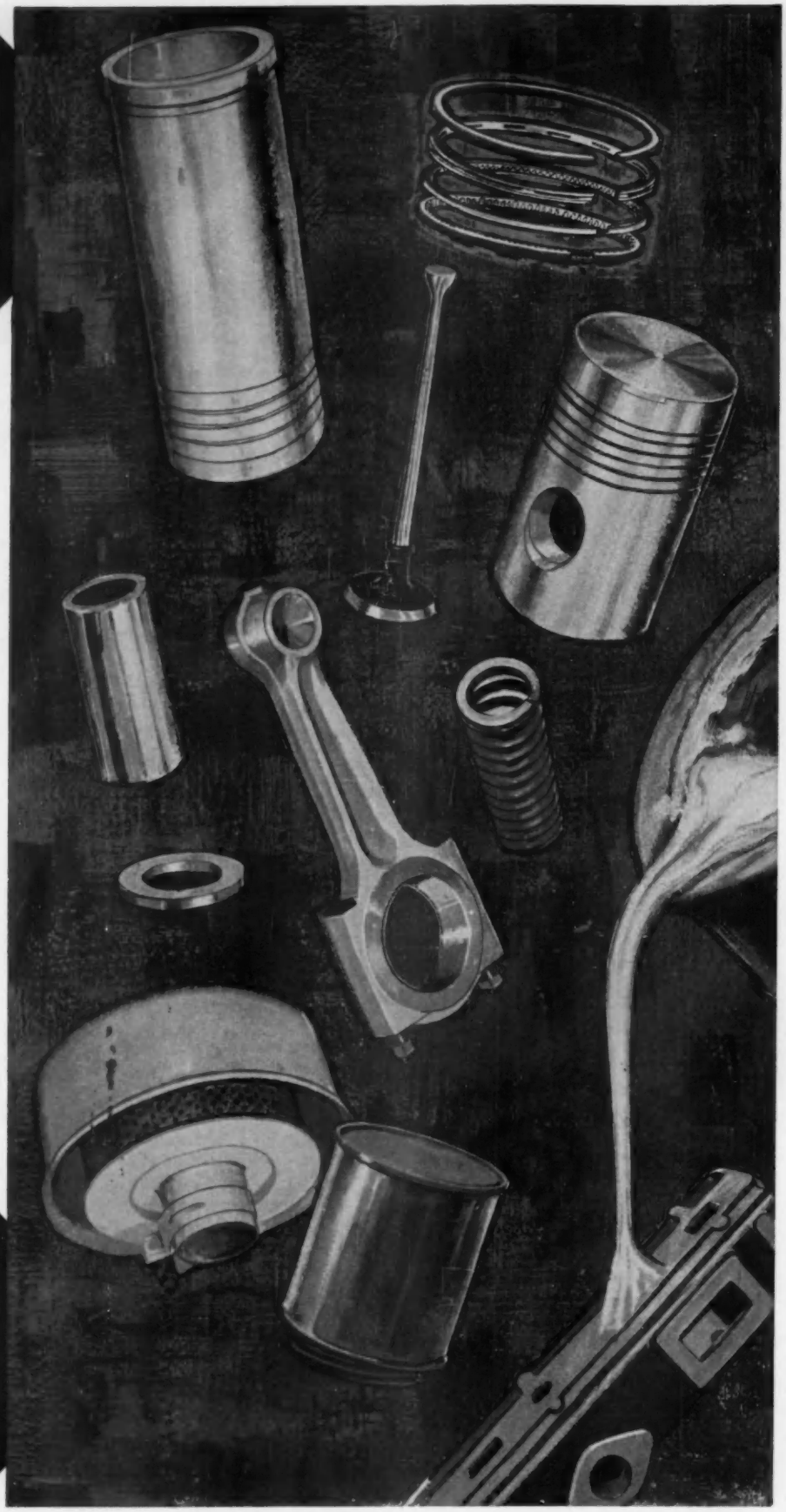
SUPERIOR

WHITE
MACHINE WORKS

BURD
GRAF FLOX

G&E

GN



Nation's largest manufacturer of heavy-duty and specialized engine parts—

NEW GOULD-NATIONAL ENGINE PARTS DIVISION

In creating its new Engine Parts Division, Gould-National combined under one corporate roof the brands, products, services and facilities of these wholly-owned subsidiaries:

Wilkening Manufacturing Co., Philadelphia, manufacturers of Pedrick® piston rings and castings.

White Machine Works, Eau Claire, Wisconsin, manufacturers of Superior-Arrowhead cylinder sleeves, sleeve assemblies, pistons, piston pins, Burd piston rings, valves and valve train parts, foreign car engine parts and filters.

Gillett & Eaton, Lake City, Minnesota, piston and casting specialists of cast iron, aluminum alloy, Vanasil® aluminum alloy pistons and specialized engine parts.

Arrow Head Steel Products, Howell, Michigan, manufacturers of aluminum pistons, connecting rods and other castings.

Now, Gould-National, the nation's largest producer of automotive replacement batteries, is also the nation's largest basic manufacturer of heavy-duty and specialized engine parts. The Division is the largest one stop source for the most complete line of engine parts available from one manufacturer. It is the only engine parts manufacturer with both iron and aluminum casting and machining facilities.

By utilizing the efforts of one combined sales force, the customer will benefit from greater sales-service efficiency, more concentrated field coverage.

Product improvement will result from the formation of a special team in the Gould-National Engineering and Research staff. It is the Gould-National way of assuring continuing top quality and improved product performance.

New engineering developments, manufacturing and production techniques from all areas within the Division will benefit all customers, no matter what the product may be.

This is the Gould-National Engine Parts Division—the nation's newest parts manufacturing group with over two centuries of combined experience.

Need heavy-duty engine parts? Automotive engine parts? Foreign car engine parts? Parts for such specialized applications as air and refrigeration compressors? Need complete and modern facilities for aluminum and iron castings? If your specifications call for the best of these, if you need them fast and need them right . . . turn to . . .

Superior-Arrowhead and Burd are trademarks of Gould-National Batteries, Inc.

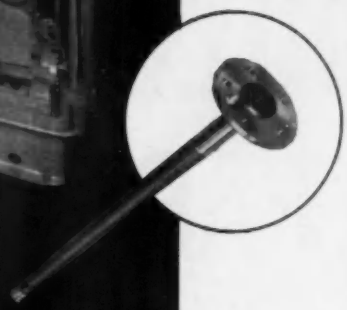
GN

ENGINE PARTS DIVISION
GOULD-NATIONAL BATTERIES, INC.
St. Paul 1, Minnesota

Circle 135 on Inquiry Card for more data

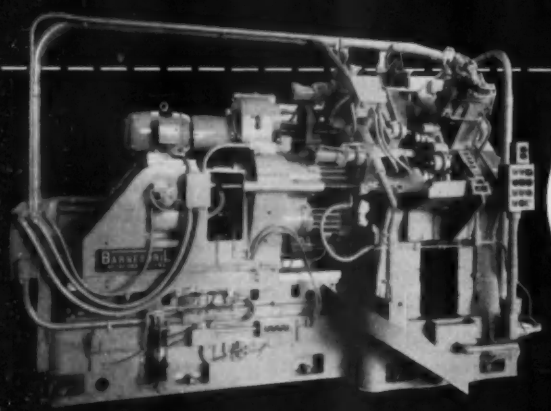
AGAIN...and AGAIN...and AGAIN BARNESDRIL ENGINEERS MEET THE CHALLENGE...

BarnesdriL 8-Station Double-End Trunnion-Type Machine drills, reams, chamfers, and probes rear axle shafts at the rate of 200 pieces per hour at 80%.

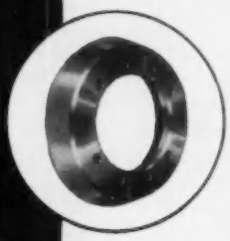


...TO SPEED PRODUCTION OF REAR AXLE SHAFTS

BarnesdriL's design improvement program led to the development of this 8-Station Trunnion-Type Machine. It produces as many rear axle shafts in one 8-hour shift as an older style Rotary Index Machine did in five 8-hour shifts.

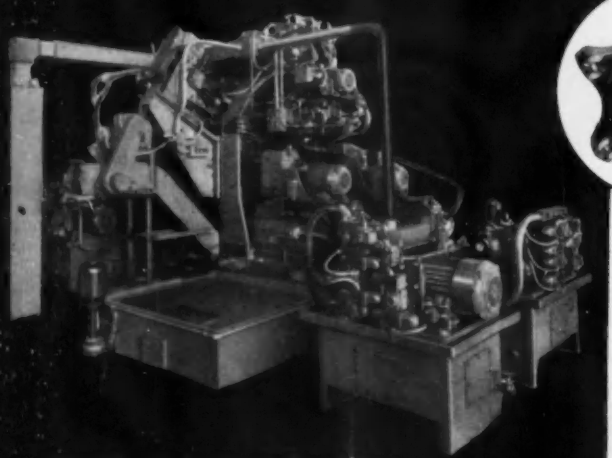


Special 8-Station Drum-Type Machine designed and built by Barnes Drill Co. for drilling, reaming, chamfering, tapping, and probing rear axle drive gears at 200 parts per hour at 80%.



...TO CUT COSTS ON REAR AXLE RING GEARS

This Drum-Type machine is a recent BarnesdriL engineering achievement to substantially increase production of ring gears for a large automobile company. Equally as important as increased production speed is the extreme tolerance accuracy and precision machining incorporated in this unit.



BarnesdriL 6-Station Trunnion-Type Machine performs drilling, threading spindle end, reaming, milling keyway, spot-facing, and probe operations on automotive steering knuckles at 208 pieces per hour at 80%.

...TO IMPROVE OUTPUT ON STEERING KNUCKLES

Another BarnesdriL Trunnion-Type Machine — a 6-Station Unit for machining steering knuckles. Application of a horizontal-type machine achieved more effective chip disposal, increased power through heavier construction, and higher speeds and feeds.

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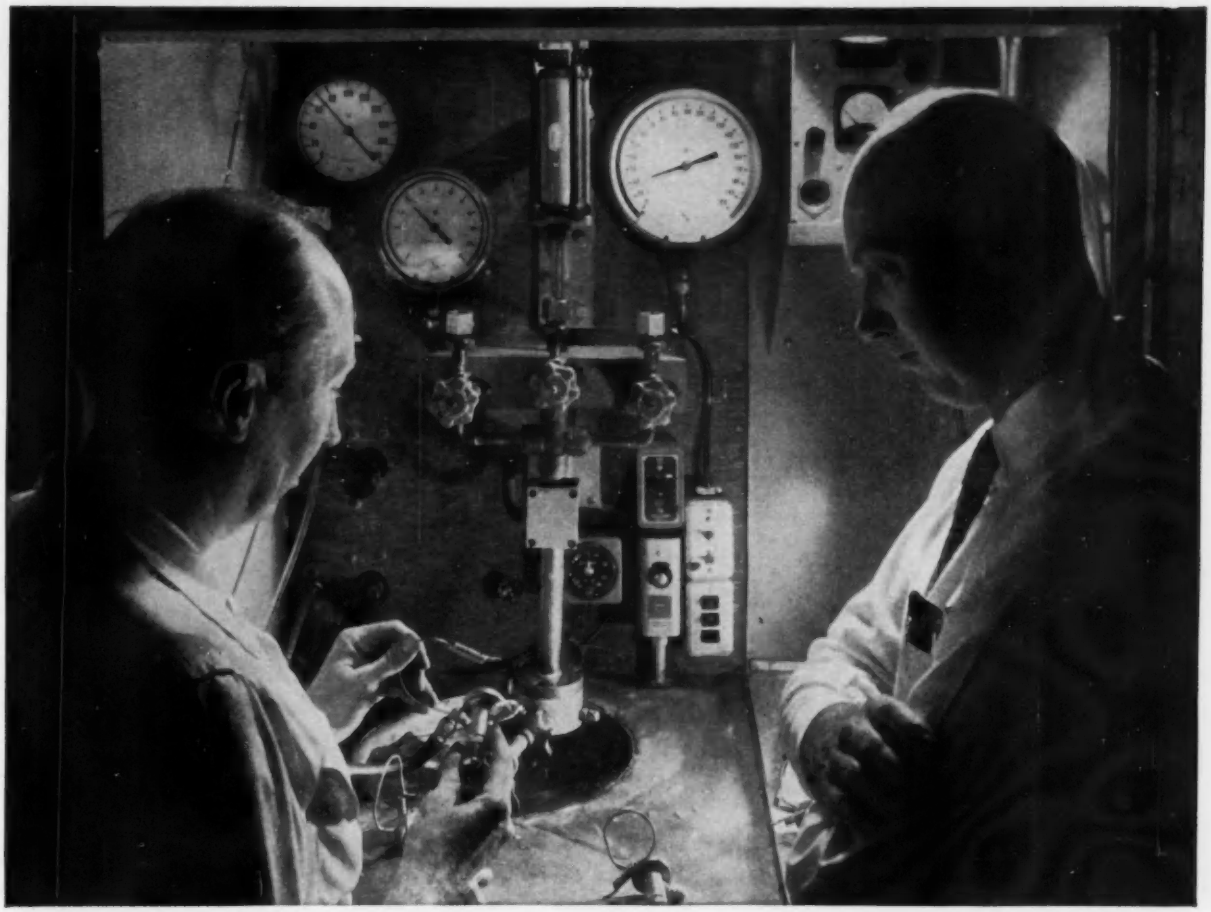

Checking the test: Fred A. Frey, Manager of Quality Control, Heating and Air Conditioning Division.

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"Power-Twin" single-acting "center-hole" cylinders. Capacities 17½, 30, 50 and 100-tons at 10,000 p.s.i.

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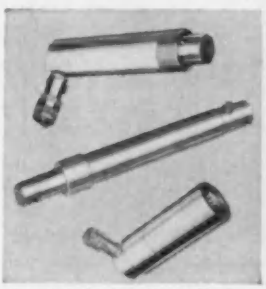

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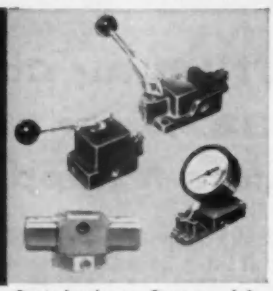

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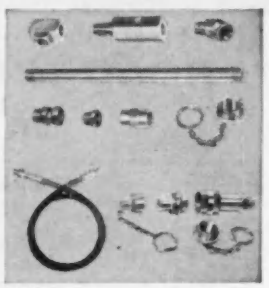

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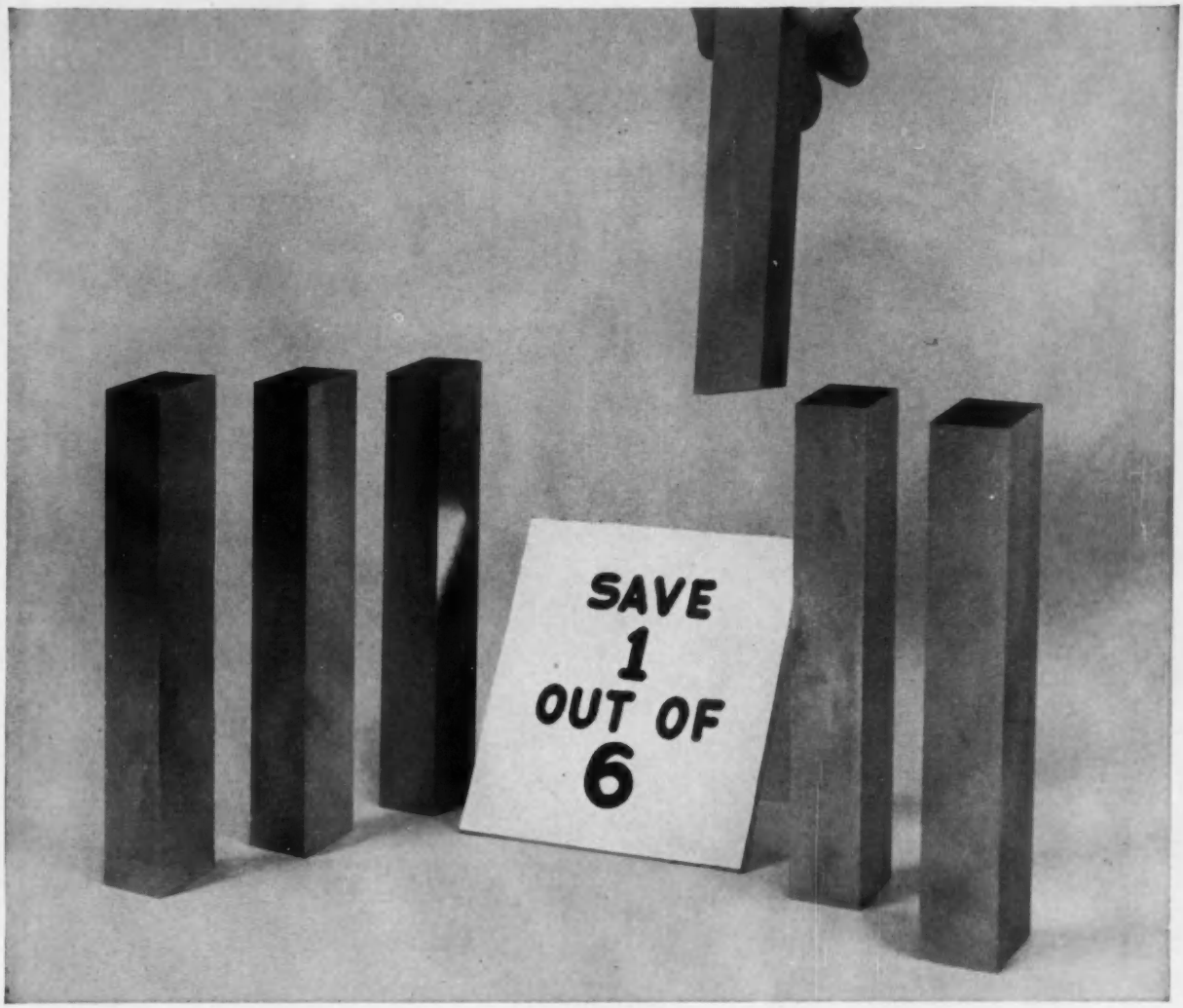

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. . . welders that have the greatest operator appeal—Lincoln **Idealarcs.** Men work better with these machines simply because they like them better.

▸▸▸LINCOLN IDEALARC WELDERS

TM, R3M and TIG are the designations for the families of Lincoln heavy-duty Idealarc welders. R3M uses DC electrodes only; the TM, both AC and DC electrodes; and the TIG, either type electrode plus the inert gas process. One or more of these machines will handle every conceivable manual welding task, and, at the same time, permit your operations to stay flexible to meet future market conditions or accommodate newly developed electrodes. And do it profitably!

Shipyard work has flat fabrication where high-speed AC electrodes are best—and vertical and overhead welding when DC is preferred. *Idealarc TM's* are available in two models—straight AC, and AC/DC. The latter was used here since with it, you can change from one current to the other just by flipping a switch . . . that fast. This kind of flexibility lets you stay competitive as demand for high speeds and top electrode performance increases.

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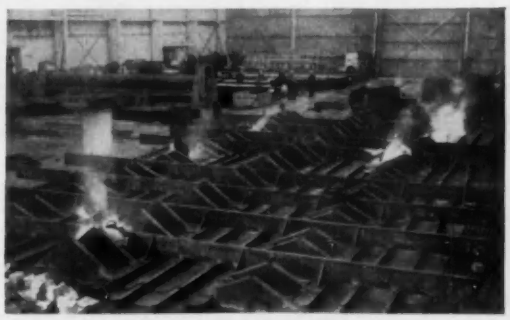

Structural and heavy equipment fabricators feel that low machine cost plus reliability are the keys to profits on long-run, repetitive production work such as this. *Idealarc TM's* were chosen here since they are the lowest cost, straight AC welder made. And they have proved dependable through years of hard service. Get facts about Idealarcs from your Lincoln field engineer . . . a specialist in welding. Or write for bulletins which describe each machine in detail.

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In many instances, the responsibility for hidden costs can be found in dirty coolant. Grinding and finishing machines as well as various cutting tools originally tested for performance with clean coolants can not function near rated capacity when the coolant contains metal chips, solid abrasives, grit, dirt and fine particles. Contaminated coolant is responsible for numerous hidden costs including *shorter tool and wheel life, frequent down time for wheel dressing, tool sharpening and sump tank cleaning.* Dirty coolant also means *higher labor and material costs, shorter useful life of oil and coolants, poor product finishes, excessive maintenance costs and an undesirable percentage of rejects.*

Benefits of Clean Coolant

Hoffman filtration equipment eliminates hidden costs — delivers the clean coolant that makes all the difference in output and profit ratios — enables you to achieve these metalworking goals:

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- Higher speeds—faster feeds
- Improved finishes — fewer rejects
- Longer useful life of coolants
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- More sustained tolerances
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- Considerable reduction in scrap loss
- Elimination of motor pumps
- 25 to 50% savings in grinding wheels, honing stones, broaches and individual machine tools

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☐ How a Hoffman Central Filtration System for thread grinding oil provided a 100% increase in grinding wheel life, a 30% production increase and a 75% overall improvement in operations at Electric Auto-Lite.

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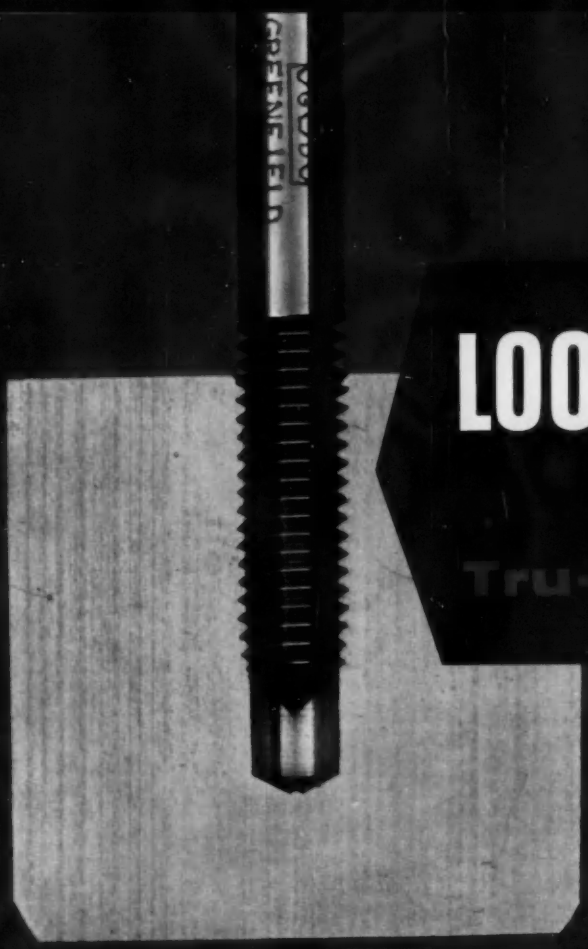

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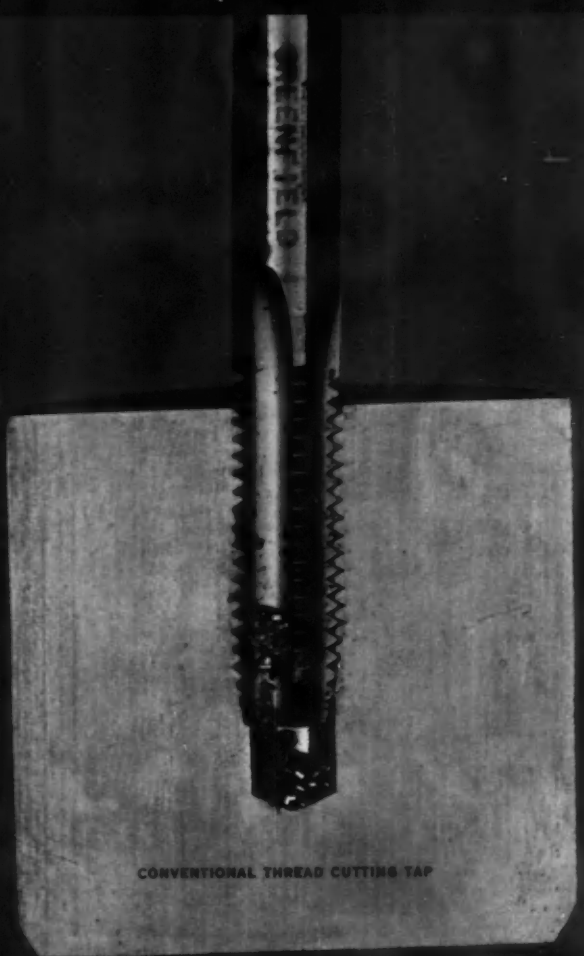

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NEWS

Vol. 125, No. 5 September 1, 1961

Cardinal Tests in Detroit

V-4, Transaxle, 2 Transmissions Studied

By James Dunne, Detroit Regional Editor, and C. B. Campbell, News Editor

Two Saab models seen driving about downtown Detroit have quite a surprise under their hoods.

They are road testing the new engine and transaxle for Ford's new compact-compact, the Cardinal. The Saabs are being used since they most nearly match the general dimensions of the new Ford model.

Meanwhile, back at Ford's Dearborn proving grounds, a third car, this one with a prototype Cardinal body and mechanical components, is undergoing tests in strict secrecy.

The Cardinal's engine is a small, water-cooled V-4 with 70 cu in. displacement which should develop about 50 hp.

Connected to Transaxle

The engine is connected directly to a transaxle. This front wheel drive setup is suspended by coil springs. Leaf springs are used in the rear suspension.

Both three and four-speed manual transmissions are being tested at present, but the three-speed box may be dropped soon to give the car more flexibility in performance.

The Cardinal will be of unit body construction with seats for four passengers. With the flat floor pan and drive axle in the front, the rear seat passengers have more comfort and room than in some bigger compacts now on the market.

In appearance, the Cardinal is said to resemble the present Galaxie more than the Falcon. Body lines are crisp and angular.

100 In. Wheelbase

The wheelbase of the Cardinal is said to be about 100 in.

The Cardinal was scheduled for introduction some time next winter. In the spring, however, Ford transferred a big chunk of die work for the new car from Germany to various firms in Detroit. Just how much this will set back the program is not known. No reason has been given by Ford for the change.

NEW MERCEDES-BENZ LUXURY MODEL

The four-door 300SE sedan is powered by a new light alloy six-cylinder fuel injection engine that develops 185 hp at 5200 rpm. It features an air suspension system, hydraulic disc brakes on all four wheels, and two new developments, automatic, four-speed transmission, and power steering. The wheelbase is 108.3 in. and overall length is 192.2 in. It is 59½ in. high.

New Fords, Olds Shown

A boom year for 1962 car sales? Yes say auto industry executives. How big a boom? Anywhere from 6.5 million to well over seven million new car sales.

These predictions were made at previews of Detroit's new car offerings for '62.

Officials from Ford, Oldsmobile and Lincoln-Mercury released details of new cars to newsmen and predicted a near-record year if the Nation's economy continues its strong upward trend.

Expects 6.5 Million Sales

Lee A. Iococca, Ford Motor Co. vice president and Ford Div. general manager, said the fourth quarter of this year would see new car sales rise to a 6.5 million yearly rate. What is more, the trend will carry over into 1962, he said. Then the 6.5 million rate will be the minimum, with sales possibly reaching as high as seven million units, Mr. Iococca added.

J. F. Wolfram, Oldsmobile general manager, believes 1962 could be the second best automotive year, surpassed only by 1955. He predicted total Oldsmobile sales of 450,000, a 25 per cent increase over 1961.

Ben D. Mills, Ford vice president and Lincoln-Mercury Div. general manager, like Mr. Iococca, was more conservative in his estimate. Mr. Mills said 1962 will see 6.5 million or more car sales.

New car details:

A total of 33 models will be marketed under the Ford name. The new Fairlane and Fairlane 500 models are the biggest news. They are referred to by Ford officials as "the right size, right price, right between Falcon and Galaxie."

Dimensions of the Fairlane make it as roomy inside as the '59 Ford, as long outside as the '49 Ford, and 1000 lbs lighter than the '61 models. Wheelbase is 115.5 in.

Two engines are offered, a six and a V-8. Styling of the Fairlane closely follows the appearance of the present Galaxie. Two- and four-door sedans are offered.

Two New Thunderbirds

Thunderbird offers two new limited production models for '62. One is a "two seat" sports roadster which has a fiberglass panel covering the rear seat. It has a standard T-bird body. The panel is designed with head rests which fit just above the front seats and is removable for four-passenger accommodation.

A vinyl-covered hardtop called the Thunderbird Landau also is new.

Falcon has a new Squire station wagon with simulated wood panels outside and a deluxe club wagon seating eight with an Econoline type body.

Oldsmobile 88 and 98 models have a longer look, with higher rear quarter panels giving a straight line appearance. Mechanical improvements include an improved Hydra-matic transmission.

Olds also claims new self adjusting power brakes, a quieter exhaust system, improved riding qualities, quieter engine operation, more clearance between steering wheel and seat and factory-sealed lubrication.

Cutlass Convertible

A Cutlass convertible is being introduced in the F-85 line. Every series will be equipped with V-8 engines exclusively.

Mercury expands its banner in 1962 to include the Comet as well as the new size Meteor and Meteor Custom line.

These new models feature unitized construction on a 116.5 in. wheelbase. Two models are offered, a two- and four-door sedan. Engines offered are the Meteor 6 of 101 hp and the V-8, 145 hp.

Altogether, there are 25 Mercury models, nine Comet and Comet Custom, four Meteor and Meteor Custom and 12 Monterey and Monterey Customs.

Lincoln-Continental will have two models again in '62, four-door convertible and sedan.

AMPHIBIOUS CAR HAS 20 WHEELS

Norwegian-designed, the Nobel-Amphibil has 16 driven wheels and two additional free-rolling pairs in front to guide it over obstructions and up steep inclines. Powered by a Volkswagen engine, it steers like a crawler tractor and can climb a 45-degree grade. It has a plastic hull.

Chassis Lubrication Periods, Oil Changes, Greatly Extended on All 1962 Models

Chassis lubrication periods for 1962 models have been extended to 30,000 and 35,000 mi. with life lubrication featured by two manufacturers. Most axles and manual transmissions are lubricated for life and oil change periods have been greatly extended.

Some makers will specify changing oil after 4000 mi. while others have extended the interval to 6000 mi. Each time the oil is drained the oil filter must be replaced on the new models.

Will Affect Dealers

The radical change in chassis lubrication practice is bound to affect the business of every gasoline station and dealers' lubrication departments but it probably will be five years before the situation will be fully felt.

More than nine cars of every 10 on the road at the end of 1962 will require normal lubrication. At the normal rate of obsolescence it will be at least five years before the 1962 and later models will be in the majority. For the extended lubrication schedules, the car owner must buy the most expensive oil at every draining interval. He also will be cautioned to replace the oil filter cartridge at the same time. In the long run, owners probably will buy more oil filter cartridges than they have up to now.

The 30,000 and 35,000 mi. lubrication period will carry the car through the hands of the first owner. But when chassis lubrication becomes necessary the costs will include removing drain plugs, installing lubrication fittings, lubricating, removing lubrication fittings, and replacing drain plugs.

Unless engineers find some other way of doing the trick, short of going to lifetime lubrication, servicing of the new models will be rather costly.

This is a generalized description of lubrication changes on 1962 models because newsmen are duty bound not to mention specific makes or to tie a specific practice with a maker. However, the material is factual and is representative of the general practice motorists will find in 1962.

NEWEST RENAULT IS SEDAN-STATION WAGON

Scheduled for October introduction, Renault's R4L model has front wheel drive with high ground clearance and flexible suspension designed for both farm work and highway driving. Top-hinged rear door gives access to trunk. This model will replace small 4CV. It uses the same 26.5 hp engine.

NEWS

CONTINUED

METALS

By William F. Boericke

Steel Orders Mount

Orders for steel continue to gain although the rate at mid-August was somewhat lower than hoped. The operating rate, now about 65 per cent of capacity, is likely to climb after Labor Day and continue to mount to a peak early in 1962. Substantial orders from Detroit for steel are reported to be awaiting the outcome of wage negotiations. Sales of hot rolled bars have been good, which is encouraging as an index of general business activity. The usual seasonal decline in demand for galvanized sheets and tin plate has been evident but pipe and structurals have improved. The market gets strong support from the appliance makers and the construction industry. In summary, the industry has followed the usual seasonal pattern. Some plants that have been shut down have reopened, indicating that more orders for steel are coming to the mills.

Aluminum Output Increases

Aluminum activity continues fairly strong after allowing for the normally dull vacation season. Domestic demand for primary ingot has been sufficient to reduce plant-held inventories to a 45-day supply at mid-year shipping levels. This has compensated for a pronounced decline in the export market. Primary production settled at about 80 per cent of potential in July. Since then other increases have been made. Kaiser Aluminum has announced it will boost its primary production to 90 per cent by reopening another potline because of improved business conditions. It represents a steady increase in the operating rate since mid-April, when the company was operating at only 52 per cent of capacity.

At the present time the primary production level is estimated at better than 1,925,000 tons on an annual basis. This represents an increase of 150,000 tons over the rate in the first quarter. Deliveries ran ahead of the new supply during most of the first half of the year. Aluminum executives expect continued but moderate gains in bookings, confined in the main to domestic demand. Little is expected from exports abroad. First-half shipments to domestic consumers were about 6 per cent ahead of last year. The shipping level for all aluminum products, including exports, had increased to a rate equivalent to 2,400,000 tons a year.

Thompson Works Resumes Operations

Not the least encouraging sign has been the announcement that U. S. Steel's big Edgar Thompson's works in Pittsburgh would resume operations after a 14-month shutdown. This appears to reflect a fatter order book. Initial plans call for production from five of the 16 open hearths at the plant. Other producers are expecting better September business. A 10 to 15 per cent gain in activity for September over August seems to be the general opinion of most steel executives.

Price Rise Still Debated

Thus far there has been little hedge buying in anticipation of a price increase that might follow the wage hike on October 1. Neither U. S. Steel nor any other major producer has given any indication of a change in steel prices. About all that has been said is that a change upward was needed but no specific statement that a rise was in the offing. Perhaps some selective price increases may be initiated on special products in greatest demand. The long-depressed steel scrap market has seen better buying, on the other hand stainless sheet and coil products still are under pressure.

Prices of Mill Products Revised

A broad revision in its catalog of mill products and prices was initiated by Alcoa and followed promptly by its competitors. Changes are being made in some extra charges, sizes, and classifications and in some product prices up and down, but no change is contemplated in the 26 cent price for unalloyed ingot. Wage increases have been in effect since August 1 but have not been followed by any general price increases by producers. But prices of some types of building sheet were marked up 8 per cent on August 1.

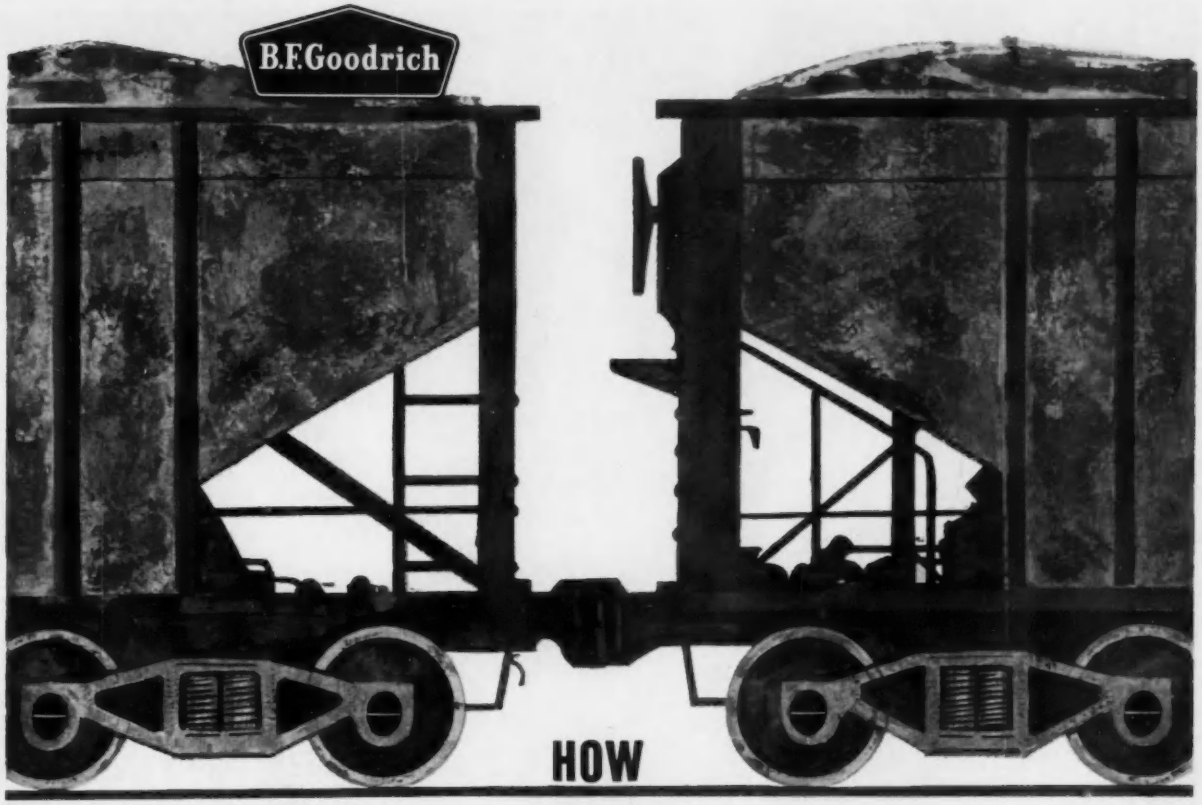
World Copper Production Exceeds Deliveries in July

The July figures from the Copper Institute showed that domestic deliveries of 113,000 tons held up quite well, while deliveries abroad to foreign fabricators fell 27,000 tons during the month. Mine production in U. S. declined 10,000 tons in July while foreign output gained 6000 tons. U. S. refined stocks at the end of July had fallen to 82,800 tons, the lowest level of the year, but foreign stocks advanced about 28,000 tons.

On a world basis, refined production exceeded deliveries to fabricators by 19,000 tons. This is the first time since last March that copper production has exceeded deliveries, and resulted in an increase in refined stocks of about 22,000 tons during the month, The figure, however, still remains 53,000 tons below the peak inventories of last March.

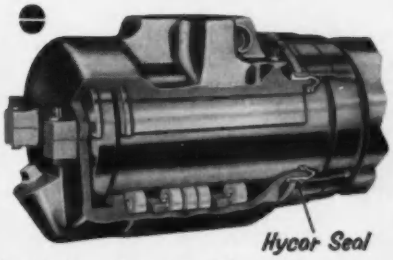
The copper market has had to face some unpleasant developments.

(*Turn to page* 158, *please*)



Clevite sealed sleeve cartridges using an oil seal of Hycar are manufactured by Cleveland Graphite Bronze division of Clevite Corporation, Cleveland, Ohio. B.F.Goodrich Chemical Company supplies the Hycar nitrile rubber for molding into seals.

HOW HYCAR PUTS A SEAL ON "HOT BOX" ELIMINATOR



Hycar Seal

Inspection of the working parts of this sealed sleeve bearing cartridge is necessary just once every nine years, according to the manufacturer. Beyond this, the only maintenance needed to assure against freight car "hot boxes" is an annual check of oil levels. Fitted against the journal inside the housing is a positive oil seal made of Hycar nitrile rubber which permanently retains the lubricant.

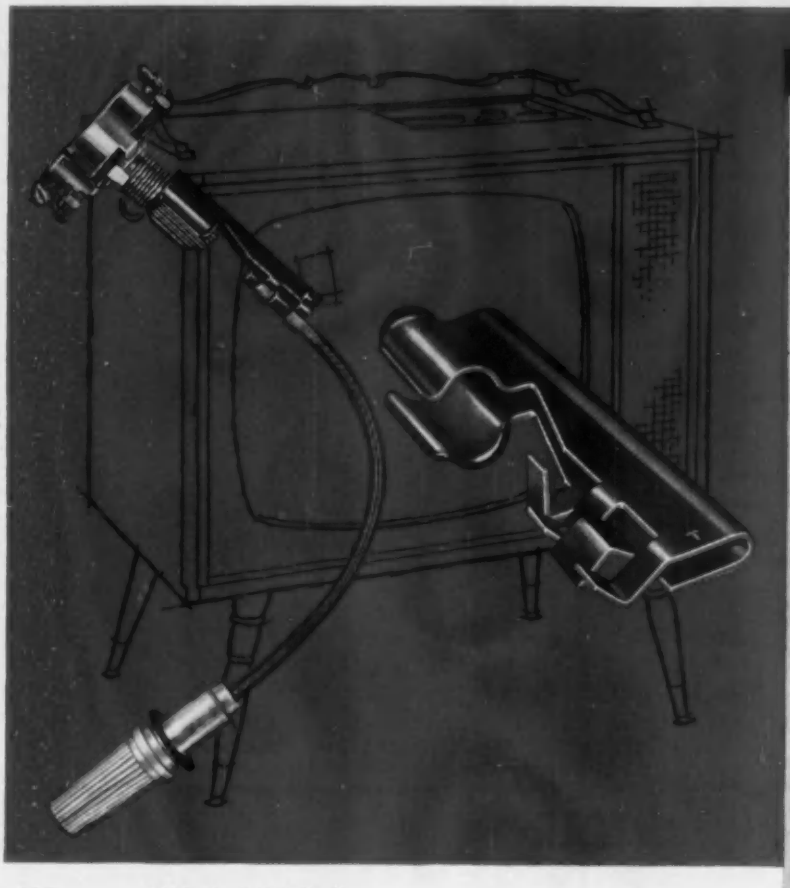
The manufacturer says, "Without question, there isn't a seal that compares with this one." He's referring to the outstanding resistance to abrasion, to oils and other hydrocarbons and to heat offered by Hycar. Years of service under these tough conditions won't affect the resilience or effectiveness of these seals. The properties of Hycar solve a tough molding problem, too.

Here's another example of how Hycar improves present products, sometimes makes possible entirely new products for new markets. Can Hycar help solve your problem? Write for information—Department MK-5. B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. In Canada: Kitchener, Ontario.

B.F.Goodrich Chemical Company

a division of The B.F.Goodrich Company

Hycar Rubber and Latex



A Tinnerman T-Marked Original...

SPEED CLIP® gives Sylvania easier, more reliable, more flexible assembly

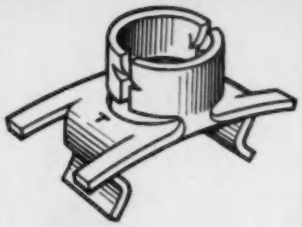
This new Tinnerman-engineered SPEED CLIP fastener provides a faster, more flexible connection between control "pots" and knobs on a TV manufactured by Sylvania Electric Products, Inc. The fastener can be applied wherever similar components are mounted and space limitations pose an assembly problem.

Several advantages are offered over methods previously used. Assembly is easier and faster... mating parts are simply pressed together and secured under live spring tension. Built-in ratcheting action permits overload slippage to protect the control from over-adjustment. Designed for use with a flexible cable, mounting of the control is completely independent of the knob location. They can be perpendicular to each other anywhere within 360°. Finally, this fastener is stamped with the Tinnerman T-mark, as are all SPEED NUT® brand fasteners. This is your assurance that Tinnerman quality and total reliability are going into your products wherever these fasteners are specified.

For samples, literature, prices, call your Tinnerman sales office... listed in the "Yellow Pages" under "Fasteners." Or write to: *Tinnerman Products, Inc., Department 12, P. O. Box 6688, Cleveland 1, Ohio.*

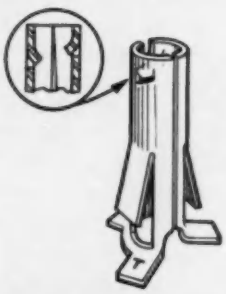
TINNERMAN
Speed Nuts®
Look for the Tinnerman "T"

T-MARK ENGINEERED SPECIALS



TRANSISTOR CLIP saves weight and space, snaps quickly into panel ... no screws, rivets. Designed for coil form retention, this SPEED CLIP fastener proved ideal for fastening transistors. Tubular retaining collar has excellent heat sink properties, openings at sides and bottom allow air circulation.

FRONT MOUNTING SPEED CLIP FASTENER cuts front panel assembly costs on popular washer-dryer. Unique self-retaining SPEED CLIP fastener permits simplified front mounting for easier, faster, lower cost assembly of front panel. No welding, staking, screw driving ... ends scrap hazard. Four fasteners engage panel mounting flange as it slips in place over curved spring fingers. Assures firm vibration resistant assembly, yet easy removal for servicing.



BOWDEN CABLE CLIP is one of many Tinnerman designs to fasten armored cable. Designed for car instrument panels, it's the perfect answer to through-panel cable fastening problems. No welding, staking, clinching, no special mounting brackets or clamps. Live spring tension prohibits vibration ... prevents loosening.

CANADA: Dominion Fasteners Ltd., Hamilton, Ontario. GREAT BRITAIN: Simmonds Aerocessories Ltd., Treforest, Wales. FRANCE: Simmonds S.A., 3 rue Salomon de Rothschild, Suresnes (Seine). GERMANY: Mecano Simmonds GMBH, Heidelberg.

Circle 145 on Inquiry Card for more data

Western BRASS

(Before)

Olin BRASS

(After)

The letterheads have been printed, signs made... and here we are wearing a new name. But in the mills things go on pretty much as they always have. We've put in some new machines and broadened our line... but essentially it's the people at Western (oops!) *Olin* Brass that really make the product. They *care*. That's the "Tailor-Made" approach.

If you're an old customer you know what we mean. If you're not – ask one of our users. Chances are he'll tell you the uniform quality and individual engineering of his metal has managed to save him money in inspection, fewer rejects and less lost time.

Olin Brass can do the same thing for you.

We're the same folks.

(Brass sales headquarters at East Alton, Illinois)

METALS DIVISION Olin
400 Park Ave., New York 22, New York.

Circle 146 on Inquiry Card for more data

Circle 147 on Inquiry Card for more data →

Custom Quality

OHIO COLD DRAWN

features improved physicals, closer tolerances, better finish

Arrows indicate approximate center of weld line. After normalizing, cold drawing and annealing, the weld area cannot be detected even when the polished and acid-etched surface is magnified 100 diameters. This perfect microstructure makes Ohio Drawn-Welded, in every sense, weldless — an ideal tubing for critical mechanical and pressure applications. In addition to cold drawing, a severe test in itself, non-destructive tests such as air, water, magnetic and eddy current, insure 100% acceptability.

A-4363A

WELDED STEEL TUBING

Now Available in Larger Sizes... Heavier Wall Thicknesses

NEWS ITEM:

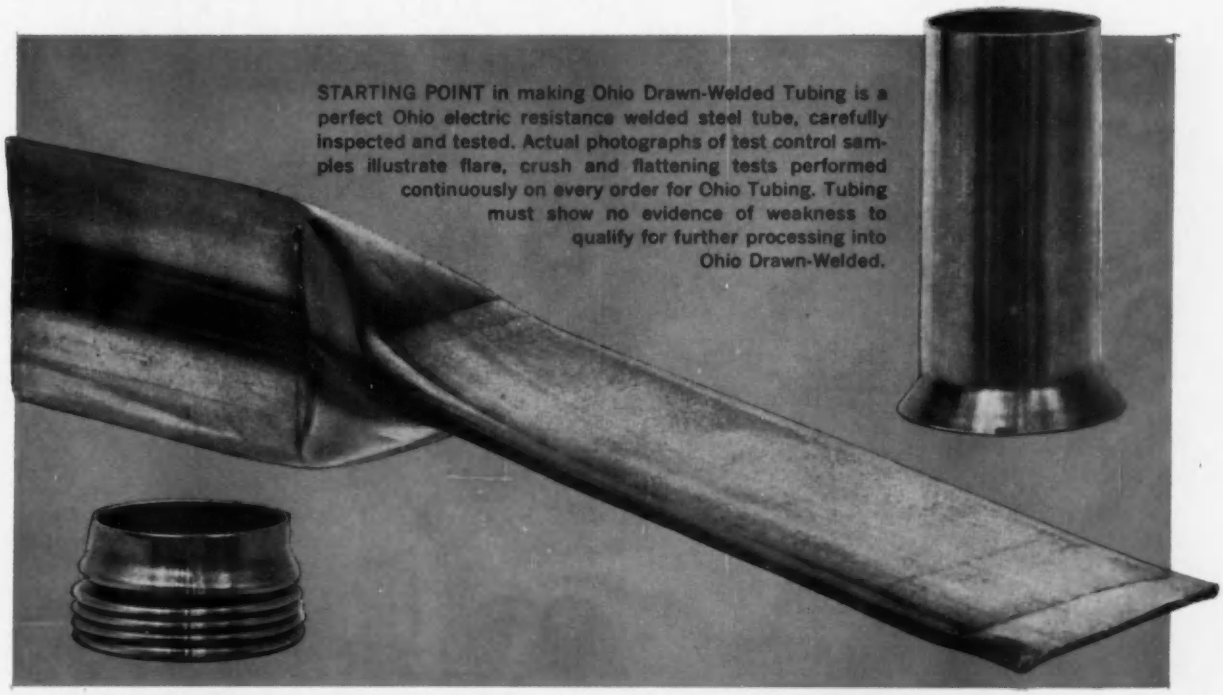
Ohio Seamless is now cold drawing quality electric resistance welded steel tubing up to 7¼ inches with wall thicknesses to .344. Ohio Custom Made Drawn-Welded Tubing is here now — in greater range of sizes, wall thicknesses, finishes than ever before.

TECHNICAL ITEM:

Controlled normalizing assures desired microstructure . . . Precision cold drawing imparts special physical properties, assures uniform wall thickness, delivers closer dimensional tolerances and superior surface finish.

ACTION ITEM:

This all adds up to a new major-source capability that can help you design with new freedom, manufacture at lower costs. Mark your orders: Ohio Custom Made Tubing. Either welded or seamless, it's your best buy whenever tubing is the best shape.



STARTING POINT in making Ohio Drawn-Welded Tubing is a perfect Ohio electric resistance welded steel tube, carefully inspected and tested. Actual photographs of test control samples illustrate flare, crush and flattening tests performed continuously on every order for Ohio Tubing. Tubing must show no evidence of weakness to qualify for further processing into Ohio Drawn-Welded.

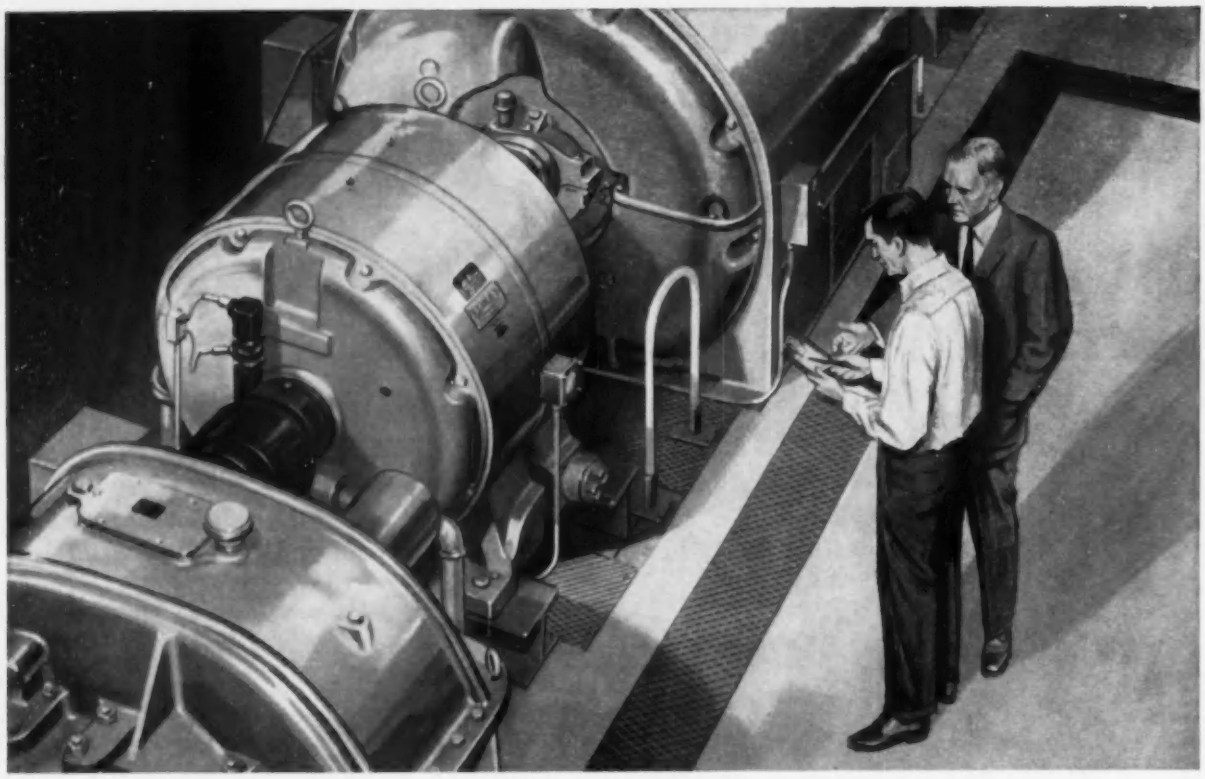
OHIO

OHIO SEAMLESS TUBE

Division of Copperweld Steel Company • **SHELBY, OHIO**

Seamless and Electric Resistance Welded Steel Tubing • Fabricating and Forging

Representatives in principal cities. Check leading directories:
THOMAS', MacRAE'S, CONOVER-MAST, SWEET'S, FRASER'S.



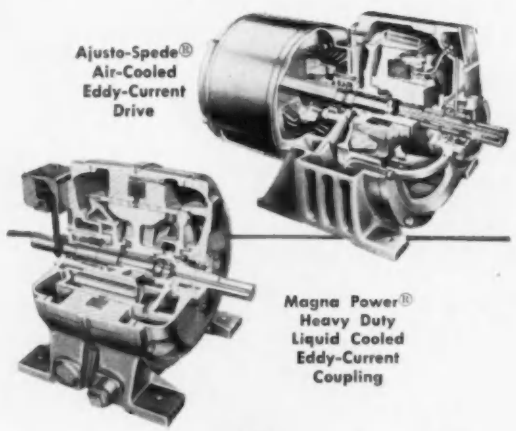
Place Your Speed Control Problems in the Hands of Experts!

As the originator and leading producer of eddy-current speed control equipment, it is only natural that Eaton-Dynamatic offers many exclusive design and construction advancements —plus expert engineering service.

The transmission of torque across an air gap by means of eddy-currents is a fundamental Dynamatic development. It was first utilized 30 years ago, and is today the operating principle of a full line of couplings, brakes, drives, and dynamometers serving industry wherever accurate control of speed and torque is required.

Eddy-current equipment runs on standard AC—requires no special power source. Electronic or transistorized magnetic amplifier controls, engineered and manufactured by Eaton, provide constant speed, infinitely adjustable speeds, and many specialized operating functions.

Representatives, located in all principal cities, are fully qualified to give you expert help with your speed control or torque transmission problems. Call the Eaton-Dynamatic representative nearest you today—there's no obligation.



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DYNAMATIC DIVISION
MANUFACTURING COMPANY
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NEWS

FEATURES

GM's Multi-Fuel Engine

Conversion Kit Can Change Present Diesels

The Detroit Diesel Engine Div. of General Motors Corp. has unveiled 12 engines which can run on fuels from gasoline to Diesel oil.

GM also has developed conversion kits which change present Diesel engines into multi-fuel engines.

Announcement of the multi-fuel engines was made to military personnel at the GM Technical Center, Warren, Mich.

Sought by Military

The engines and conversion kits are the result of armed forces demands for a single engine for all fuels.

Starting with a GM Diesel engine, engineers stepped up the compression ratio, remodeled the cylinder and fuel pump, added a new needle valve injector, and made other adjustments.

"At first glance," said Kenneth L. Hulsing, assistant director of engineering at Detroit Diesel, "the few changes necessary appear so ridiculously simple that one wonders why this was not done years ago."

Clyde W. Truxell, general manager of Detroit Diesel, said the new engines "meet the power requirements of practically any military application." They range from 20 to 650 hp.

"Tooling and plant facilities for the new line are complete," Mr. Truxell said. Acceptance of the line by the military will insure "a substantial high level" of employment at the Detroit installation. Production can start at once at the Detroit plant.

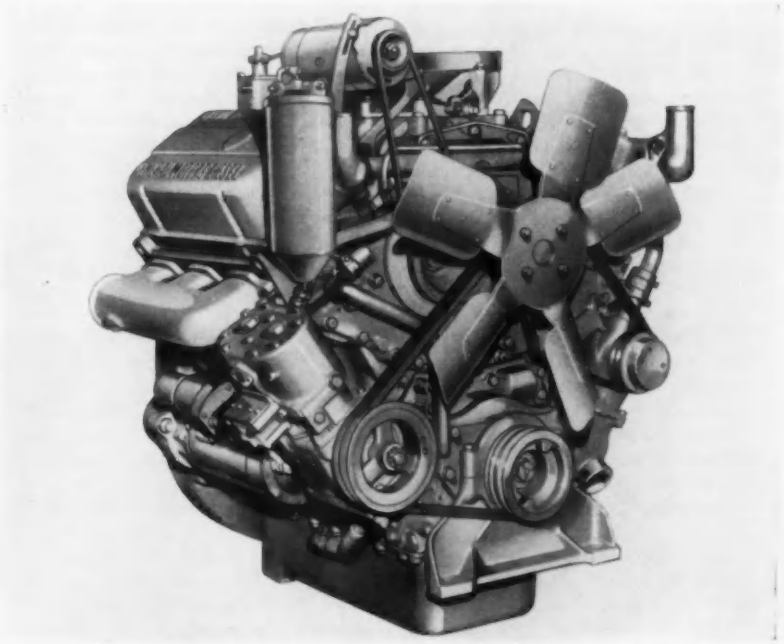
Mr. Truxell said GM started working on the engines shortly after World War II without allocation of armed forces funds for research and development.

The new engines can burn gasoline, jet fuel, kerosene or Diesel fuel. Their power varies with the type of fuel used.

Navy Jet Engines

The Navy has awarded a $36.6 million contract to Pratt and Whitney Div. of United Aircraft Corp. for additional production of jet engines—models J57-P-20, J52-P6, and J57-P-59W.

The Navy uses the J577-P-20 engine on F8U-2N Crusaders, and the J52-P-6 models on A2F-1 Intruders.



Engine Used in Multi-Fuel Demonstration

TABLOID

Data which can be used as guides for the design of paddle pumps for specific applications in solvent extraction equipment have been prepared for the Atomic Energy Commission. Also available are two reports on water leakage from valves used in power reactors and the pumping characteristics of a turbine contractor.

* * *

A total of 87.4 million motor vehicle operators licenses were in force in the U. S. during 1960. The estimate, prepared by the Bureau of Public Roads, U. S. Dept. of Commerce, was 3.4 per cent higher than the 84.5 million in force in 1959.

* * *

A review of standard laboratory test procedures for determining the sensitivity, brisance, and stability of high explosives, primers, pyrotechnic compositions, and propellants, has been compiled by the Army.

* * *

A metal-ceramic electron tube of planar design, heated externally by a radioisotope, passed proof-of principle tests and warrants further development, according to an Air Force research report.

* * *

Anyone seeking an idea for a new business, product, or production technique may find it in the latest supplement to the Patent Abstract Series. This seven-volume third supplement describes thousands of government-owned patents, nearly all of which are now available for license at no charge.

* * *

A guide to the properties exhibited by various fluids and solids at low temperature is furnished in a three-part Air Force report.

* * *

A portable tripod gantry that can be assembled in 20 minutes and can hoist more than six times its weight has been developed for field maintenance and salvage of Army helicopter components.

Current information on the tensile properties of eight metals and metal alloys at cryogenic temperatures has been compiled and is available to industry and the public.

* * *

Average octane ratings for domestic motor gasolines apparently have leveled off after climbing steadily for nearly a decade, the Bureau of Mines, Dept. of the Interior, has reported. Regular, premium and super-premium grades sold at filling stations last winter had octane numbers virtually unchanged from those for the same grades during the summer of 1960.

* * *

Automobile and truck tires with low rolling resistance and smaller power loss can be manufactured by using a vinylic filler in place of the conventional carbon black filler. This is part of an Army research report released to industry and the public.

* * *

An ultracompact nuclear power plant that could be assembled on earth, transported by rocket, and operated on the moon is described in an Atomic Energy Commission research report. Capable of full-power continuous operation for two years with automatic control, the plant would be used to furnish energy for lunar spacecraft refueling stations, television relays, and stellar and physical observatories.

* * *

A discussion of the origin of cosmic rays, a report on semiconductor bolometers, and a Soviet scientist's interpretation of quantum mechanics, are included in a collection of articles translated from a Russian journal.

* * *

A riveted doubler plate was found to be an excellent arrestor of cracks in metal plate tested to observe behavior of arresting devices by Navy metallurgists. Also available is a review of methods of correlation and extrapolation of creep and stress-rupture data.

Mercedes Mobile Home

The automobile that you can live in—with a kitchen and lavatory—is here if you want to fork out $11,000 to $15,000.

It's a Mercedes-Benz executive coach. New this year, it's basically a modification of the 17-passenger Mercedes-Benz Microbus introduced three years ago.

It is powered by either a four-cylinder gasoline or four-cylinder Diesel engine.

The coach looks like a small bus with a sun roof and curtained windows. It has its own water supply and auxiliary electric generator and can be supplied with air conditioning and a telephone.

Besides the kitchenette, complete with refrigerator, stove and lavatory, it has three sleeping berths, movable arm chairs and a desk that folds up or can be removed from the car.

GM Foundry Expansion

Chevrolet announced the planned construction of a new foundry building to be devoted to manufacturing development at the division's grey iron foundry complex in Saginaw, Mich.

Plant Manager John R. Ikner said work on plans for the new building are well under way and that construction is scheduled to begin this month. The new facility should be in operation sometime next summer.

James E. Bowen has been appointed as general superintendent in charge of the new installation. Ralph W. Pearce, who has been a production superintendent at the grey iron foundry, will succeed Mr. Bowen as superintendent of inspection.

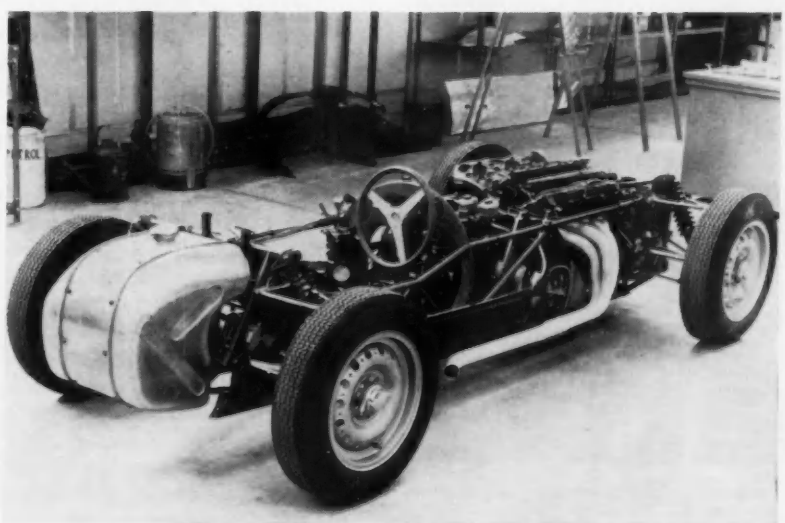
Ferguson Racing Car Has 4-Wheel Drive; Master Differential Divides Torque Evenly

The Ferguson racing car with non-spin four-wheel drive and non-skid braking is a rolling test bed for the passenger car that Harry Ferguson Research in England plans to introduce in 1963. For maximum road grip during acceleration and cornering, it has an unusual master differential that divides the engine torque evenly among the four wheels under all conditions.

This power divider couples the engine to the front and rear differentials not only through a conventional bevel-type differential, but also through individual spur gears on the two propeller shafts. These pairs of gears have a slightly different ratio that that of the final drive, and each secondary gear has an overrunning clutch in its hub to prevent the obvious jamming that would result from the conflicting ratios during normal running.

When any road wheel spins, the propeller shaft, to its differential (front or rear), tends to speed up, but is checked by the overrunning clutch which locks that shaft to the gearbox output. The effect is limited slip and constant traction on all wheels.

For skidless braking, the car uses the Dunlop Maxaret system already employed on aircraft landing wheels. The inboard disk brake on each independently-sprung wheel incorporates a flywheel-actuated valve in the hydraulic circuit. When any wheel slows excessively prior to locking and skidding, the valve automatically relieves the pressure and bleeds off the fluid to reduce the braking effort on that particular wheel.



Ferguson's 4-Wheel Drive Racing Car

The racing car is powered by a 2.5-liter Coventry Climax engine developing 239 hp at 6750 rpm, and the five-speed gearbox is combined with the master differential in a single compact unit. In production form the Ferguson car is expected to be powered by a 90-hp flat-four engine mounted ahead of the front axle.

Chevrolet Asks Action

Chevrolet Motor Div. has asked for early approval of its offer to purchase a government-owned plant in Saginaw, Mich. which the division has been leasing for manufacture of transmissions.

The request was revealed by Edward H. Kelley of Detroit, general manufacturing manager of Chevrolet in charge of the division's 35 plants in the U. S.

Mr. Kelley said Chevrolet had submitted a bid of $1.4 million for the 130,000 sq ft plant, which was erected in 1942 by Chevrolet for the government. The building has been leased since World War II by Chevrolet and comprises approximately 40 per cent of the space devoted to transmission manufacture in Saginaw.

The General Services Administration, which advertised the plant for sale, has approved the Chevrolet bid subject to approval of the Justice Department. Chevrolet's bid was the only one submitted.

Government Post

Thomas E. Drumm, Jr., who has served the government for the last 15 years, has been appointed administrator of the Business and Defense Services Administration, U. S. Dept. of Commerce.

Armco Zinc Line

The steel industry is building new production capacity into its coated-steel lines to meet the ever increasing demands of the nation's auto makers. The use of zinc coated steel in 1961 is setting all-time tonnage records and 1962 will see more records.

One new zinc coating line, constructed primarily for the automobile market, was put into operation by Armco Steel's Middletown, O., Works. Called the largest of its kind in the industry, the 72-in. line can produce 30 tons of galvanized steel in sheet or coil form per hour.

Logan T. Johnson, president of Armco, said the $8.5 million unit "reflects our confidence that the galvanized steel market is based on a solid foundation. Proven applications and new uses, made possible by improvements in fabricating properties and paintability in particular, form a solid basis for continued growth."

Recent uses of zinc-coated steel in automobile frame sections and rocker panels have proved successful not only in preventing corrosion, but also in giving engineers a strong, workable material similar in properties to regular sheet steel.

New applications are foreseen in automobile bodies in the near future. Two in particular are the lower sections, including floor pans, of unit body cars, and the tail gate sections on station wagons.

Galvanized steel has been available for a great number of years, but its widespread use in automobiles was held up mainly because of its poor paintability.

This problem has been overcome by two different processes, differential coating and spangle-free chemically treated surfaces.

Ford Earnings Soar

Financial statements released by Ford and Chrysler reflect the upturn in automobile sales during the second quarter of 1961. Both companies recorded a profit for second quarter operations, although Chrysler's profits were not large enough to offset the first quarter losses.

Ford's consolidated net income for the second quarter was $133.2 million, compared with $76.2 million in the first quarter. This second quarter total was nine per cent more than the $121.7 million earned in the second quarter of 1960.

Consolidated sales in the second quarter of 1961 were $1878.3 million, five per cent higher than 1960 second quarter sales of $1790.4 million.

Chrysler showed a net loss of $15.7 million for the first six months of 1961. A profit of $6.2 million in the second quarter was recorded which partially offset the $21.9 million loss in the first three months.

For the first six months of 1960, the company recorded earnings of $23.7 million.

Ohly Heads SAE Unit

Charles W. Ohly has been elected chairman of the Detroit Section, Society of Automotive Engineers, for the 1961-62 season. He is vice president and general manager of Thompson Products Div., Thompson Ramo Wooldridge.

Others elected for 1961-62 were Harold C. MacDonald, Ford Motor Co., as vice chairman; Robert Anderson, Chrysler Corp., secretary, and George Delaney, retired, treasurer.

GM Earnings Decline

General Motors' sales for the first six months of 1961 totaled $5812 million according to the corporation's second quarter report. This compares with $7109 million in the first six months of 1960.

Net income amounted to $440 million compared to $612 million in the first half of 1960.

Chairman Frederic G. Donner and President John F. Gordon noted that "the improvement in general business activity in the United States which began in the first quarter of 1961 gained momentum in the second quarter. Sales of cars and trucks in the second quarter, although below the level of the second quarter of last year, showed an increase over the first quarter that was substantially above the normal seasonal pattern."

Factory sales of cars and trucks produced in General Motors plants throughout the world totaled 2,094,000 units in the first six months of 1961, or 21 per cent below the 1960 total for the corresponding period.

TWO MILLIONTH V-8 ENGINE TESTED

"Hot test" of two millionth V-8 engine produced at Chrysler Corp.'s Mound Rd. engine plant is observed by Inspector George Richards (left); A. W. Hartig, general manager of Chrysler engine, axle and transmission plants, and L. B. Bornhauser (right), group executive, power train manufacturing.

INDUSTRY STATISTICS

By Marcus Ainsworth, STATISTICAL EDITOR

WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Make	Weeks Ending Aug. 19	Weeks Ending Aug. 12	Year to Date 1961	Year to Date 1960
PASSENGER CAR PRODUCTION				
Total—American Motors	.....	.....	217,310	325,153
Chrysler	.....	.....	53,769	55,245
De Soto	.....	.....	.....	16,474
Dodge	.....	.....	84,176	271,752
Imperial	.....	.....	4,083	8,663
Lancer	.....	.....	25,915	4,869
Plymouth	.....	.....	102,502	162,955
Valiant	.....	.....	69,795	175,083
Total—Chrysler Corp.	.....	.....	340,240	695,041
Comet	.....	3,213	115,563	110,469
Falcon	1,119	7,330	315,921	325,995
Ford	4,042	9,944	510,248	646,003
Lincoln	.....	257	17,675	12,817
Mercury	.....	285	63,060	99,094
Total—Ford Motor Co.	5,161	21,029	1,022,467	1,194,378
Buick	1,624	.....	103,039	162,513
Buick Special	552	.....	51,270	1,264
Cadillac	603	.....	89,979	109,938
Chevrolet	99	.....	755,880	1,165,179
Corvair	246	.....	209,522	170,641
Oldsmobile	1,914	.....	137,443	256,059
Oldsmobile F-85	597	.....	37,064	1,309
Pontiac	2,838	.....	132,597	306,058
Tempest	1,881	.....	70,336	.....
Total—General Motors Corp.	10,064	.....	1,587,132	2,194,961
Total—Studebaker-Packard Corp.	1,696	.....	31,223	70,316
Checker Motors	98	95	3,610	4,714
Total—Passenger Cars	17,019	21,124	3,201,982	4,484,563
TRUCK AND BUS PRODUCTION				
Chevrolet	4,874	.....	207,514	274,676
G. M. C.	1,311	.....	42,449	75,715
Diamond T	36	10	1,110	1,956
Divco	55	60	1,479	2,712
Dodge and Fargo	1,146	.....	41,206	47,775
Ford	1,172	6,132	214,766	238,438
F. W. D.	14	10	557	647
International	205	160	90,292	83,949
Mack	275	230	6,400	10,273
Studebaker	144	36	4,063	9,136
White	336	312	10,706	11,485
Willys	3,064	.....	70,189	87,925
Other Trucks	80	80	2,560	3,193
Total—Trucks	12,712	7,030	693,293	847,880
Buses	80	8	2,366	2,713
Total—Motor Vehicles	29,811	28,162	3,897,641	5,335,156

NEW FOREIGN CAR REGISTRATIONS*

JUNE

1961		1960	
Volkswagen	16,267	Volkswagen	12,007
Renault	4,051	Renault	5,377
Triumph	1,185	Opel	2,365
English Ford	1,124	English Ford	2,146
Fiat	1,100	Triumph	1,811
Metropolitan	1,073	Austin-Healey	1,793
Mercedes-Benz	1,037	Fiat	1,789
M. G.	1,032	M. G.	1,365
Austin-Healey	990	Simca	1,301
Volvo	985	Peugeot	1,229
All Others	7,225	All Others	10,948
Total	36,079	Total	42,101

SIX MONTHS

1961		1960	
Volkswagen	87,904	Volkswagen	76,040
Renault	19,860	Renault	38,247
Fiat	6,583	Opel	15,497
English Ford	5,914	English Ford	15,132
Mercedes-Benz	5,890	Fiat	12,366
Triumph	5,251	Triumph	8,956
Volvo	5,075	Austin-Healey	8,867
Opel	4,913	Simca	8,519
Austin-Healey	4,536	M. G.	7,445
Metropolitan	4,423	Peugeot	7,135
All Others	38,728	All Others	68,760
Total	189,077	Total	266,964

TRACTOR SHIPMENTS

WHEEL TYPE

Hp. Ratings	June	Six Months
9-34 belt hp.	2,130	12,923
35-39 belt hp.	2,998	17,896
40-49 belt hp.	3,706	22,587
50-59 belt hp.	1,948	21,610
60 belt hp. and over	5,832	40,065
Total—Wheel Type	16,617[1]	115,091[2]

TRACKLAYING TYPE

20-59 net engine hp.	667	4,502
60-129 net engine hp.	707	3,281
130 net engine hp. and over	697	3,571
Total—Track Type	2,071[3]	11,354[4]

[1]—Valued at $35,247,000
[2]—Valued at $283,582,000
[3]—Valued at $25,175,000
[4]—Valued at $128,794,000

1961 NEW REGISTRATIONS*

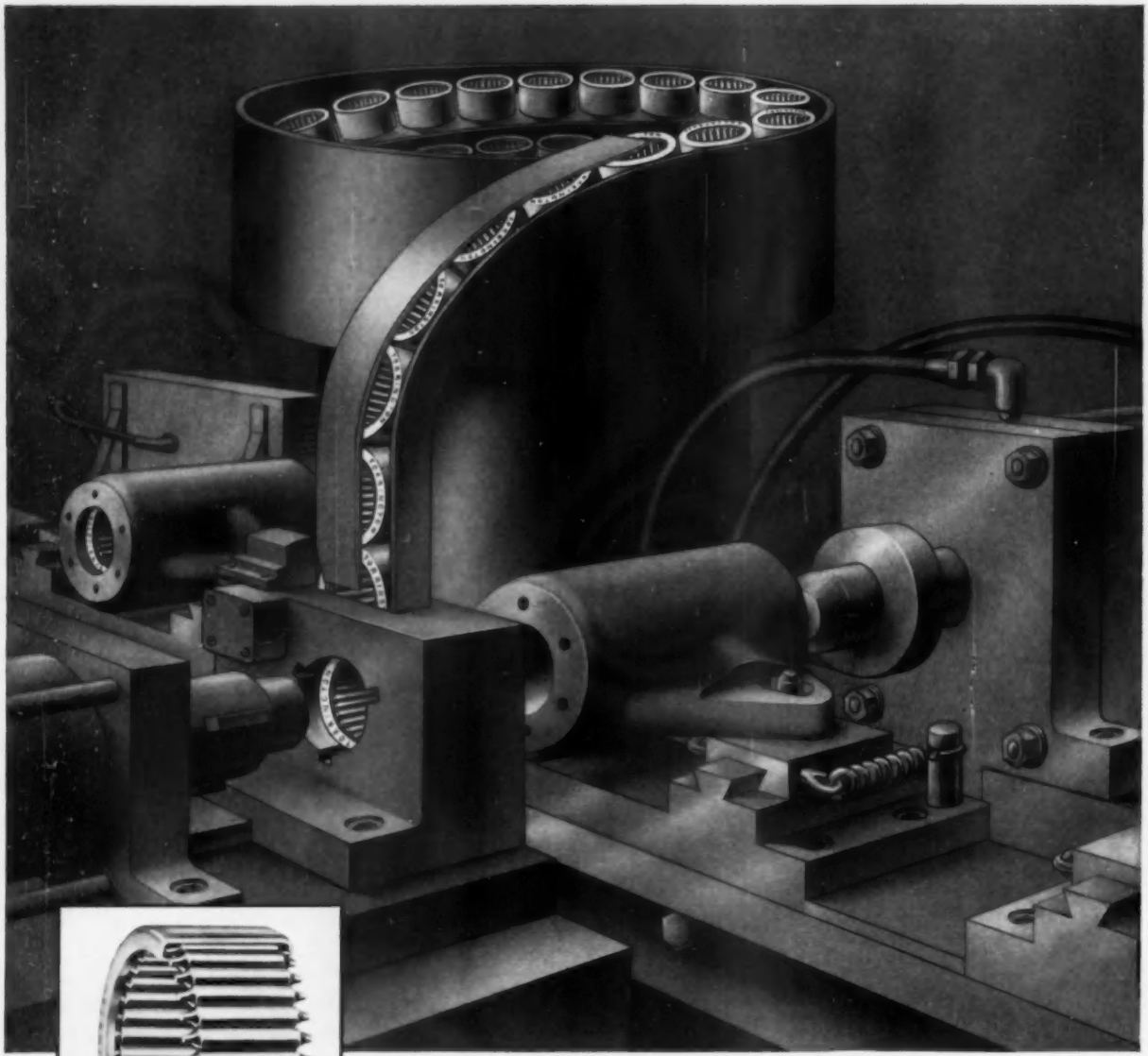
NEW CARS

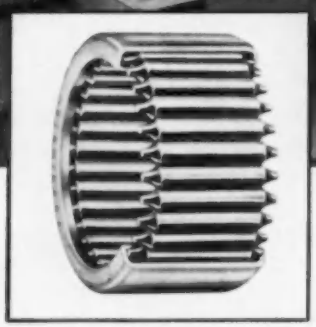
Make	June 1961	May 1961	June 1960	Six Months 1961	Six Months 1960
Chevrolet	165,375	151,316	161,284	793,962	891,973
Ford	132,119	129,568	117,685	659,932	729,506
Pontiac	34,697	33,059	35,288	182,352	208,911
Rambler	35,783	32,585	41,156	177,311	220,728
Oldsmobile	29,546	28,377	28,360	155,926	179,134
Plymouth	26,661	27,537	43,652	150,603	240,748
Buick	28,921	25,805	22,096	139,967	135,994
Dodge	20,861	21,258	38,177	114,578	194,322
Comet	20,033	18,319	17,583	90,651	55,289
Cadillac	12,142	12,777	11,966	73,404	76,974
Mercury	11,731	10,741	13,019	59,851	82,235
Chrysler	8,591	6,289	6,927	45,327	41,395
Studebaker	6,010	7,100	9,608	37,346	59,476
Lincoln	2,359	2,646	1,493	15,439	11,992
Imperial	848	828	1,230	5,512	8,353
Misc. Domestic	518	726	3,030	4,394	20,412
Foreign	37,227	35,240	43,309	193,683	273,207
Total—All Makes	573,422	546,173	595,864	2,900,238	3,430,651

NEW TRUCKS

Make	June 1961	May 1961	June 1960	Six Months 1961	Six Months 1960
Chevrolet	27,572	29,065	29,513	146,656	167,865
Ford	24,923	27,372	24,799	140,172	147,315
International	10,432	10,576	10,145	51,014	56,164
G. M. C.	5,731	6,392	7,728	33,327	41,190
Dodge	3,461	3,837	3,449	19,319	22,083
Volkswagen	3,006	2,356	2,673	13,017	15,816
Willys Truck	1,501	1,414	1,591	8,979	9,601
White	1,411	1,455	1,384	6,674	8,069
Willys Jeep	1,252	852	954	4,964	5,000
Mack	731	853	991	4,415	6,016
Studebaker	529	619	650	2,858	2,389
Diamond T	168	147	246	903	1,433
Brockway	68	68	99	416	614
All Others	684	724	1,313	4,172	7,525
Total—All Makes	81,469	85,730	85,535	436,886	492,760

* Compiled from official state records. Data property of R. L. Polk & Co. May not be copied, sold or reprinted without Polk permission.





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MEN IN THE NEWS

Clark Equipment Co. —Samuel D. Richards has been elected secretary.

Eaton Mfg. Co.— Edgar W. Clark has been promoted to director of marketing services.

Motec Industries, Inc. —Maj. Gen. John S. Guthrie (ret.) has been elected a vice president.

Sharon Steel Corp. —Irvin A. Varraux has been appointed manager of industrial relations.

Gabriel Co. — William R. Donnelly has been named vice president-finance.

Borg & Beck Div., Borg-Warner Corp.— A. A. Krueger (far left) has been named vice president, sales, and R. L. Smirl has been promoted to vice president, engineering.

Borg-Warner Corp.—**Morton B. Millenson** has been appointed manager of economic research.

Willys Motors, Inc.—**James Beattie, Jr.**, has been promoted to vice president and general sales manager.

Ford Motor Co.—**J. C. Dean** has been named assistant comptroller.

General Motors Corp., AC Spark Plug Div.—**John R. Church** has been appointed director of distribution and marketing.

Borg-Warner International Corp.—**Alonzo B. Knight** has been elected president.

General Motors Corp., Defense Systems Div.—**Bernard W. Crandell** has been named director of public relations.

Ford Motor Co., Ford Div.—**Donald C. Burdette** has been named Philadelphia district sales manager.

Fansteel Metallurgical Corp.—**James G. Duggan** has been elected secretary and treasurer.

Bendix Corp.—**George W. Phillips** has been elected president of Bendix do Brasil Equipamentos Para Autoveiculos, S. A.

General Motors Corp., Chevrolet Motor Div.—**Benjamin L. Lemmer, Jr.**, has been promoted to general superintendent-plant engineer at the Tonawanda, N. Y. engine plant.

Chrysler Corp.—**John vonRosen** has been named director of the Corporate Manufacturing Staff and Services.

International Harvester Co.—**R. W. Dibble** has been appointed manager of farm equipment product planning.

Ford Motor Co., Ford Div.—**Thomas C. Page** has been named planning and research manager and **William A. McNamee** has been promoted to programming manager.

Ford Motor Co., Automotive Assembly Div.—**Peter J. Sherry** has been appointed assistant industrial relations manager.

Judson L. Thomson Mfg. Co.—**Douglas Downs** has been named vice president-engineering.

B. F. Goodrich Co.—**Karl O. Nygaard** has been named manager of market planning.

General Motors Corp., GMC Truck and Coach Div.—**John A. Castle** has been promoted to director of public relations.

Lockheed Aircraft Corp., California Div.—**Roy A. Shettel** has been promoted to plant engineer.

Michigan Tool Co.—**George Mickas** has been named manager, Research and Development Dept.

General Motors Corp., AC Spark Plug Div.—**Harold L. Wardrop** has been promoted to manager of sales development and cataloging.

Ford Motor Co. of Canada, Ltd.—**William P. Park** has been promoted to general manufacturing manager.

General Motors Corp., Delco Moraine Div.—**Marke E. Rasper** has been promoted to director of sales and engineering.

Necrology

Ralph E. Woodburn, 55, former president of Fabricators, Inc., died Aug. 12 in Bloomfield Township, Mich.

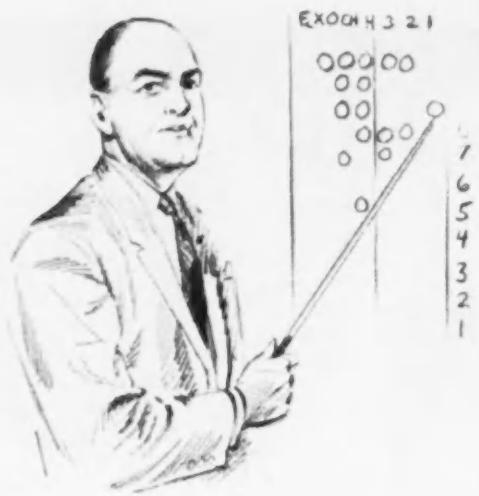
Roy C. Noll, 64, zone manager for the Fram Corp., died Aug. 12 in Leamington, Ont.

Laurence A. Murphy, 60, senior vice president of Deere & Co. and a great-grandson of John Deere, founder of the farm machinery concern, died Aug. 8 in Moline, Ill.

Henry V. Lefere, 75, co-founder of the Riverside Forge and Machine Co., died Aug. 2 in Jackson, Mich.

Edwin J. Lewis, 53, general manager of replacement sales for B. F. Goodrich Tire Co., died July 28 in Akron, O.

Charles W. Manzel, 82, inventor of lubricating devices and founder of Manzel Bros., now the Manzel Div. of Houdaille Industries, died July 25 in Buffalo, N. Y.



NUMERICALLY CONTROLLED DRILLING...

A short cut to a fast payoff

by Gordon Deagle
Engineer, Bore-Matic Division
The Heald Machine Company

Drilling has long been one of the simplest and most universally used operations in the machine tool field. Furthermore, of the various numerically controlled machines, the *drill* is one of the quickest to return its cost through resultant savings.

This is due largely to the fact that the increased accuracy required in most of today's drilling operations has heretofore been met by building expensive jigs and fixtures. And often these special fixtures have been made obsolete due to design changes long before they have repaid their cost through savings.

Many people think of numerical control only in terms of very high production. But with drilling this is not the case at all.

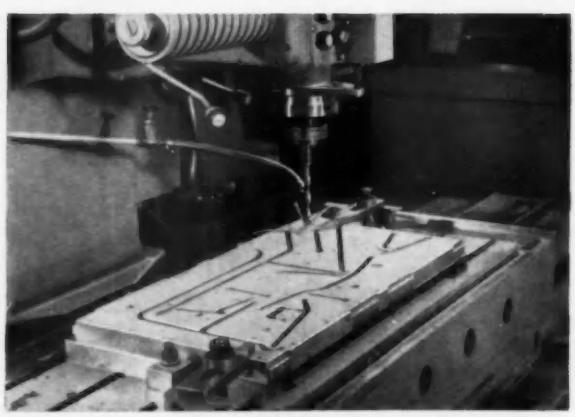
The HEALDRILL, a high-precision automatic tape-controlled drilling machine, has been profitably applied on many short run jobs involving frequent changeovers. In fact operating experience in our own drill department proves that the cost savings are even greater where small lots of many different parts are involved than on high production jobs where the expense of special jigs and fixtures might be recovered before obsolescence.

A case in point is the Heald hydraulic valve plate illustrated here in a setup on the machine. A mating pair of these plates forms a multi-channel valve panel which requires 54 drilled holes, 44 drilled and counterbored holes, and 75 holes that are drilled, reamed and tapped. All of these operations are now done on the numerically-controlled HEALDRILL and all cycle functions are fully automatic except for tool changes. Based on manufacturing in lots of 10, with a total of 200 before obsolescence of the part, the HEALDRILL method has saved $39.90 per panel over the jig method. This is a total saving of $7,980.00 on one job alone—almost 20% of the entire cost of the machine!

Hole positioning, feeds, speeds, rapid traverse and full depth limits, and drilling or tapping cycle are selected by the tape and hence are completely independent of the operator's skill, accuracy or speed. Tool changes, when required, are indicated by the machine and can be made in a matter of seconds. And total floor-to-floor time can be reduced by as much as 50 per cent. Changeover to another job requires no setup time except that required to insert a new tape in the control unit and locate the part on the table.

Preparation of the control tape for a new part is fast and relatively simple. With a HEALDRILL, sample and pilot lot production can be accomplished in days instead of weeks, and at minimum cost.

HEALDRILL in operation in drill department of The Heald Machine Company in Worcester, producing precision drilled, bored, counterbored, reamed and tapped parts for other Heald machines.



Hydraulic valve panels with 173 holes are precision drilled, counterbored and tapped on the HEALDRILL, at a saving of $39.90 per panel.

For complete information on the numerically-controlled HEALDRILL contact your Heald engineer—or send for a copy of Bulletin 2-20-48.

It Pays to come to Heald

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.
Worcester 6, Massachusetts

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an Editorial

The "Inside" Story of Better Profits

FINANCIAL REPORTS FOR THE SECOND QUARTER of 1961 revealed some very fascinating facts. Many companies in the automotive industries proved that they could increase profits despite a smaller gross volume. These experiences partly awakened some executives to the potentials for future savings through cost reduction methods and equipment improvement and modernization. In response to the suggestions of leading manufacturing executives and engineers throughout automotive plants the current issue of this magazine was designed to help manufacturing executives additionally improve their production equipment, methods and operations.

THERE HAS BEEN NO PREVIOUS OCCASION when such a vast array of examples of improvement through modernization of machine tool production of automotive parts was compiled and published. The editors are grateful to all of the automotive industry executives and machine tool industry executives for their cooperation in this vital project. The eventual result of the use of the information in this issue should be to reduce costs, increase output and employment, improve earnings and aid in industry-wide production modernization.

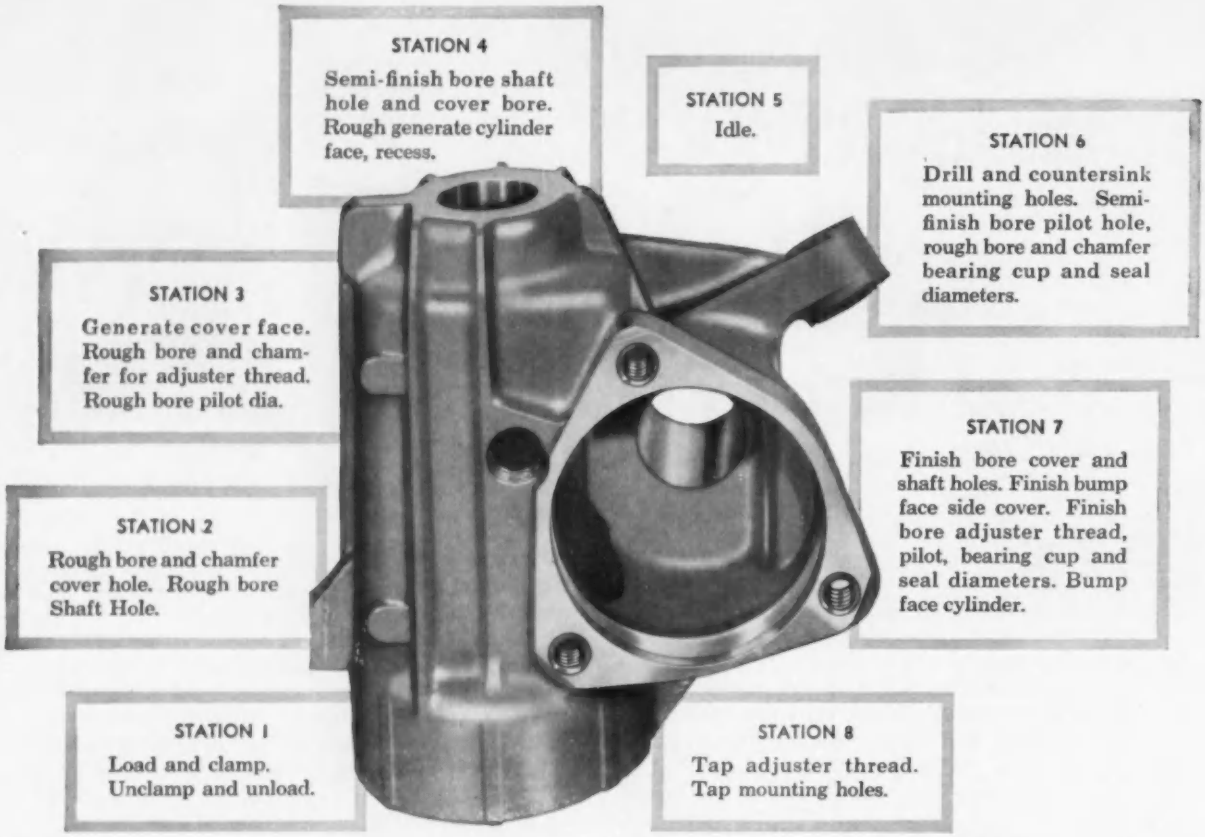
IT WAS POINTED OUT NOT LONG AGO by Morris M. Lightstone that it is now quite practical in automotive parts manufacturing to distinguish between machine capability and machine performance. In brief, the methods of analyzing and evaluating the potentials for production improvement are well known. But to use these methods, there is a need for a much greater stockpile of machine operating performance data than has been available in the past. This issue of AUTOMOTIVE INDUSTRIES provides the best practical start toward developing and using such a stockpile of case examples in every plant.

HOWEVER, PRODUCTION ENGINEERS cannot do this job single-handedly. It is the duty of the "top, top executives" to familiarize themselves with these great potentials for improvement and to appropriate the funds necessary for prompt ordering and installation of new equipment. This issue should therefore be of tremendous importance to not only the "top, top executives"—but also to the corporate directors who want to have specific case example data to guide their judgments in encouraging production equipment modernization and improvement programs.

THE "PLANNING CHART" INSERTED in the last pages of this issue can be used successfully by everyone from the supervisory level to the top executive level, for working out improvement programs. Readers are asked by the editors to unfold this chart, study it, fill it out with the data needed to put new projects into action, and use the case examples and data in the issue to calculate some of the practical results which may be obtained by improving equipment now. In each plant in which this magazine is read, the principal production executives will also receive a separately mailed envelope containing additional technical data, to aid in improvement specifications, covering the products manufactured by the advertisers in this issue who have supplied data for this mailing. Combined, all of these sources should give every plant management in the industry a virtual blue-print to better profits for 1962.

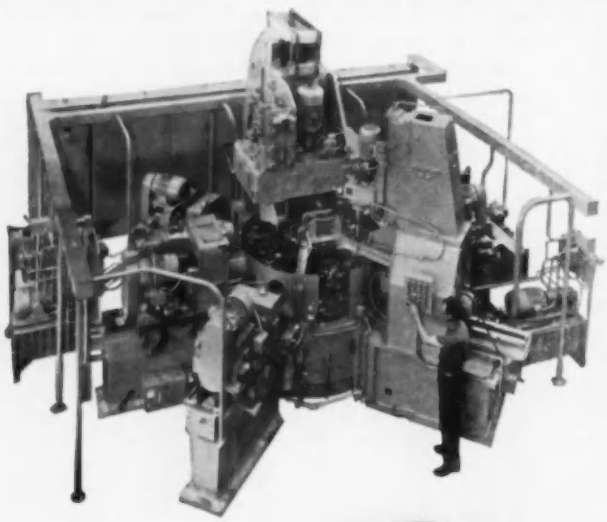
Hartley W Barclay

Editor and Publisher


STATION 4
Semi-finish bore shaft hole and cover bore. Rough generate cylinder face, recess.
STATION 5
Idle.
STATION 6
Drill and countersink mounting holes. Semi-finish bore pilot hole, rough bore and chamfer bearing cup and seal diameters.
STATION 3
Generate cover face. Rough bore and chamfer for adjuster thread. Rough bore pilot dia.
STATION 7
Finish bore cover and shaft holes. Finish bump face side cover. Finish bore adjuster thread, pilot, bearing cup and seal diameters. Bump face cylinder.
STATION 2
Rough bore and chamfer cover hole. Rough bore Shaft Hole.
STATION 1
Load and clamp. Unclamp and unload.
STATION 8
Tap adjuster thread. Tap mounting holes.

153 Aluminum Steering Gear Housings per hour

automatically processed on this GREENLEE Machine



This Greenlee 8-Station Horizontal and Vertical Spindle Machine is establishing some excellent performance records for a leading automotive manufacturer. The 52 inch table carries 8 work fixtures. Each has power clamping. To insure rigidity and accuracy, the table is clamped hydraulically metal to metal. Indexing is fully automatic. Cycle time is 23.5 seconds. Like all Greenlee machines it's built for long, continuous service. Can be modified economically if desired. Have our representative give you complete information.

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WITH THE FUTURE IN MIND

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GREENLEE BROS. & CO.
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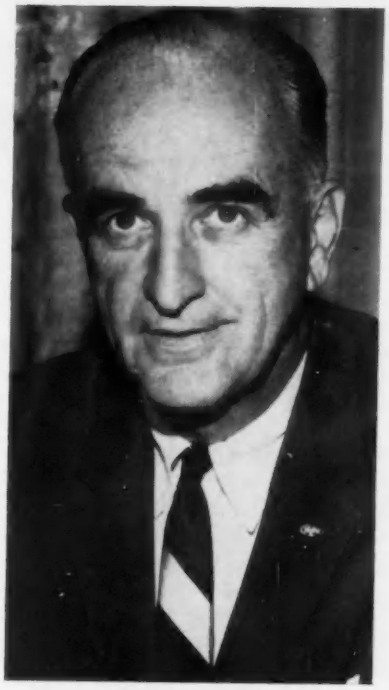


LUDLOW KING

Major Allies in AUTOMOTIVE RELIABILITY

Many of the Major Objectives of the Reliability Programs of Automobile, Bus, Truck, Engine and Tractor Manufacturers Can Be Substantially Aided by Close Cooperation with Machine Tool Builders.

By Ludlow King

Executive Vice President

THE NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION

THE "Reliability" Programs of manufacturers in the automotive industries have represented one of the most important advances in total management concepts in recent years. They have provided a "pace-setting" new trend in the evolution of techniques which take advantage of the largest number of innovations in engineering, design and manufacturing available and convert these innovations into profitable and economical operating methods.

The Reliability Programs assure management closer control of many major decision areas. These programs enable management in the automotive industries to pin-point more effectively major long range as well as short range objectives and to integrate such programs with the new and important systems concepts of product planning.

Machine tool builders of our country have developed many new aids to assist the automotive industries in implementing their respective Reliability Programs. They can be utilized successfully and profitably in the following areas:

1. Improvements in control of quality of metalworking output.
2. Improvements in control of quantity of output.
3. Reductions in operating cost per piece produced.
4. Improvement of flexibility of operations.
5. Reductions of floor space requirements.
6. Maintaining constant manufacturing rates.
7. Advances in input and output handling of materials.
8. Planning inventory requirements of input and output.
9. More exact planning, estimating and designing output.

The proofs of these benefits are positive and irrefutable. Data required for analysis of individual cases, however, must be provided by the prospective buyer to specific machine tool builders before an adequate study of total capabilities can be developed.

Where full and complete cooperation exists between the machine tool user and the machine tool builder, in many cases new and significant results can be expected. The machine tool industry feels that it has penetrated some major new horizons of operating results, and that these accomplishments represent opportunities to the automotive industries for the attainment of objectives in improved reliability well beyond that attained in the past.

In considering this outlook for automotive manufacturing, the status and economic position of obsolescent and out-moded metalworking equipment must be considered. It would be difficult, if not virtually impossible, to plan for the attainment of current objectives of optimum reliability through dependence upon the machine tools and production equipment typical of even five years ago. And yet, in almost every manufacturing plant, systems have seldom been developed and used to rigidly re-examine the production capabilities of five-year-old machine tools of many types, as compared with the newest models. Indeed, it is quite possible that design and production studies based upon typical kinds of production cost data, achieved through using five-year-old machine tools as the basis for calculations, would lead the estimator into serious errors and faults in evaluating 1962, 1963, 1964 or 1965 production plans.

One of the best methods which an individual manufacturer can follow to assure the adequate evaluation of production status is to make at least an annual plant-wide evaluation of production improvement potentials. Using such a plan, the product planning and production planning engineers systematically obtain and evaluate all of the machine tool manufacturers data concerning new and improved equipment. Where available, the production cost studies provided by such manufacturers can be used to establish examples of economies and profits which can be obtained through using new equipment. These reports can then be submitted to top management for further analysis and study and incorporation in an overall company-wide or division-wide manufacturing equipment development program.

As the programs in the automotive industries continue to evolve, it is hoped that more and closer cooperation will be sought from U. S. machine tool builders. The members of the N.M.T.B.A. feel certain that they can successfully meet these ever-expanding needs for information, economic studies and "capability" projections. They invite the executives and directors of Reliability Systems to seek machine tool manufacturing cooperation. Through such relationships it can be confidently expected that the progress of the automotive industries can be bulwarked by the best efforts of the suppliers who specialize in making the nation's basic production equipment. ■

Why Review Production Equipment Now?

By Joseph Geschelin
DETROIT EDITOR

EXPERIENCE has shown that the National Machine Tool Show, held on a five year cycle under the sponsorship of NMTBA, provides master mechanics and top manufacturing executives with examples of the most advanced metalworking equipment known to the art. As a matter of fact, some items of equipment are so advanced in principle that it has taken two to three years after the Show for their adoption. While the Show presents the entire NMTBA membership in full dress, it is important to note that machine tool builders are continually at work on the improvement of existing types of machine tools. Moreover, their engineers are constantly turning their inventive genius to new methods, better ways of doing the routine jobs.

Checking Production Equipment

As a result of such activity on the part of hundreds of producers in the machine tool field there is a constant flow of new ideas, new methods, and new equipment. This stream of ideas and changes provides the spark for the regular replacement policy of metalworking plants. Even the largest motor car manufacturers do not initiate large machine tool buying programs every model year. But it is good business to keep track of all production equipment at regular intervals to make sure that it is in good operating condition; and that economy is not penalized by obsolescent methods.

One cannot escape the fact that just as soon as a more economical way of doing the job makes its appearance, the organization that does not take advantage of it is losing economy and time. An obsoleted method simply cannot pay its way even if the machine is in good operating condition.

This is particularly true in these days of rising costs of materials and labor. Competition among producers is so intense that every effort must be made to keep metalworking equipment right up to the minute in productivity and cost economy. For it is certainly true that if a competitor is using an advanced technique or more up-to-date equipment he will earn an important cost advantage in the market place.

Joseph Geschelin

Savings With New Equipment

In mass production, in particular, every effort is made to acquire advanced equipment because such equipment not only pays its keep but will pay for itself within a reasonably short space of time. Often the new equipment is of such nature that it produces other savings besides those inherent in its cost economy. We refer to the many instances where highly productive machinery is so compact as to replace a number of older machines, thereby saving valuable floor space and making this floor space available for other operations.

Up to recently the major criterion for buying a new machine or adopting an improved technique was *productivity* since this is the essential ingredient in engineering economy. But the current emphasis upon Reliability has altered the picture completely. Reliability compels undivided attention to quality control, specific kinds of surface finish, and levels of dimensional control that were unheard of except in aircraft and missile work up to now. Where such requirements are imperative it is necessary to study each machine as well as its tooling and gaging to make sure it will meet the requirements of the overall program. To quote a trite truism—you can't inspect quality into a product; you have to build it in.

Achieving Reliability

Thus it becomes necessary to appraise every piece of equipment, speeds and feeds, tooling and fixturing, and gaging methods. When the entire industry warrants its vehicle output for 12 months or 12,000 miles (Lincoln-Continental for 24,000 miles) there is no longer room for compromise.

Suffice it to say that the major vehicle producers are searching out every avenue in this connection. But what of the parts makers? When a vehicle carries the 12,000 mile guarantee, it applies to every component (except specific items that are excluded). This extends the circle of Reliability to include suppliers of every kind. Each supplier must meet the test of Reliabil-

(*Turn to page* 160, *please*)

Automotive Metalworking

MAKING PRODUCTION PAY

By Charles A. Weinert
EASTERN EDITOR

A Comprehensive Exhibit of the Increased Efficiency of Latest-Model Machine Tools in Automotive Parts Production

AI Presents 2nd Annual Report on "Making Production Pay" Containing the Largest Single Array of Exclusively-Automotive Machine Tool Applications Ever Appearing in Print. Displayed are More Than 400 Examples of How the Added Productivities of Modern Machine Tools Reduce Automotive Part-Manufacturing Costs

TECHNOLOGICALLY, machine tools have continued to advance to a marked degree. The mass-production fields of American industry particularly—as well as the ultimate consumers—are receiving substantial benefits from the unceasing contributions of the machine tool builders. "Cases in point" have been the many design advances incorporated in production equipment for the automotive industries.

The improvements, in most cases, were devised with one primary objective in mind. That objective is to reduce wherever possible the cost of manufacturing parts which enter into end products. The ingenious advances therefore offer, among several major benefits, added efficiency and productivity of the machine tools—and thus savings in manufacturing cost.

In other cases, additional objectives have entered into the manufacturing picture—such as the need for meeting closer tolerances, the need for improved finishes, or the need for greater manufacturing reliability. These requirements, too, have been met many times by the machine tool builders.

Stated another way, the overall (and familiar) objectives usually are, "the same product quality at reduced cost," or "a higher quality product at the same cost."

Often *both* a higher-quality product and a reduced cost are achieved by machine tool developments. Sometimes these advances are contributed solely by the machine tool builders. And sometimes they are the result of a cooperative effort between the machine builder and the automotive user.

The automotive industries, on the whole, have been among the first to adopt improved methods and techniques for producing automotive parts in high-volume quantities. Nonetheless, because of the wealth of machine tool developments continually taking place, *plant engineers, as individuals, often find it difficult to keep currently posted on many of these developments.*

In an effort to fill that need, AUTOMOTIVE INDUSTRIES, throughout the year, regularly publishes feature articles on major applications of machine tools in automotive plants. In addition, AI also publishes, in every issue, descriptions of latest offerings of the machine tool builders. (There are other machine tool feature stories, as well.)

As a further specialized service to automotive machine-tool users, AI has, for many years, dedicated its September 1 issue to "posting its readers more comprehensively on machine tool developments of various categories."

Last year's September 1 issue contained three machine-tool feature articles, besides descriptions of the machine tools exhibited at the three Chicago shows. One of the feature articles was entitled

Improvement Planning Section

"Making Production Pay." This article demonstrated the increased productivity of various *types* of 1960-model machine tools compared to that of their 1950-model counterparts—based on data supplied by the machine tool builders in response to AI's survey request.

With the foregoing as a background, we have been leading up to explain one of our newest undertakings for intensively posting automotive machine tool users on latest production equipment applications.

For purposes of this 1961 Machine Tool and Production Equipment Edition of AI, we recently surveyed the machine tool builders again — requesting their cooperation in supplying data for a sequel to "Making Production Pay."

The goal was "to present to the automotive manufacturing industries numerous examples of how *specific automotive parts* can be produced more economically than heretofore by the application and use of newest-model machine tools."

So that, briefly, is the setting—and theme—for the automotive production information in "Part II of Making Production Pay," presented on the pages which follow.

The data furnished us by the machine tool builders have been segregated into six major categories—by Engine parts, Power Train parts, Chassis parts, Body parts, Electrical parts, and "Other" parts.

Following each Part designation under a major category, this type of information is given in capsule form:

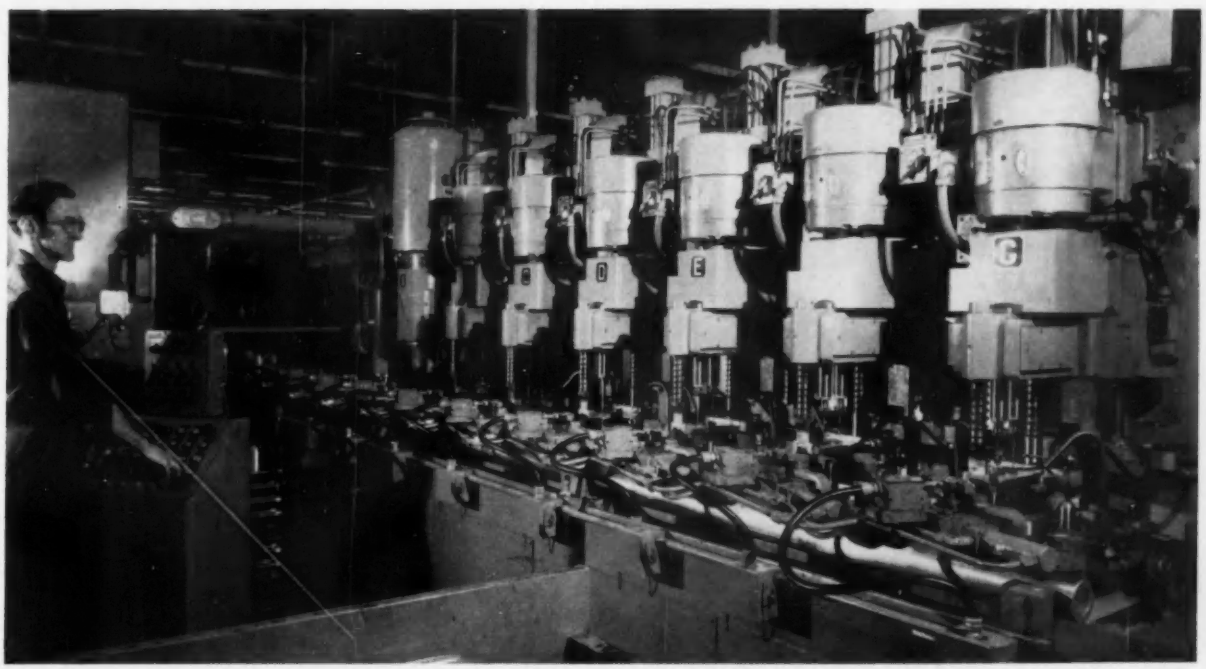
(1) Kind of operations performed on the part;

(2) Approximate Added Efficiency of the new machine (or new process) compared to that of its predecessor, or Output of new machine, and/or such other aplication information or features as may be available from the data supplied by the machine tool builder;

(3) Make and Model of machine invoved; and

(4) Machine maker's Data Reference identification (where available).

We have also assigned a number to each item. This number may be encircled by the reader on the enclosed Inquiry Form (page 119) in those instances where additional information on the machine is desired from the equipment builder. AI, through its readers' service, will in turn see that such requests are transmitted to the M-T company for appropriate attention. ■



At Ford Motor Company's engine plant in Lima, Ohio, seven different drilling, milling, and reaming operations are performed on pistons as they pass through this completely-automatic machine. Capable of handling 600 pistons per hour, the machine is one of many transfer-type units being used by Ford for engine parts' production.

Making ENGINE Production PAY

Cylinder blocks and heads, crankshafts, camshafts, pistons, pins, rods, valves, rocker arms, manifolds, flywheels, carburetors, pumps, timing gears, etc.

FLYWHEELS—Turning, facing, undercutting, drilling, boring, reaming, tapping, inspection, cleaning, and assembly of ring gear. First section of machine has chucking provision for operations requiring rotation of workpiece. Both carbide and ceramic throw-away inserts are used. An induction heating unit, part of the in-line machine, expands the ring gear so it can be automatically assembled in a press station near unload end of machine. Two different designs of flywheels are processed in this Cross Transfer-matic machine.

Circle 317 on Inquiry Form, page 119, for more data

DISTRIBUTOR DRIVES, CAMSHAFT—Hobbing of teeth. Added efficiency 50 to 75 per cent over other methods. Barber-Colman No. 16-16 Multicycle Hobbing machine. Multicycle feature plus automatic loading speeds production.

Circle 318 on Inquiry Form, page 119, for more data

CAMSHAFT DRIVE GEARS—Hobbing of teeth. Added efficiency at least 100 per cent above older Model AHM machine. Barber-Colman No. 14-15 High-Speed Hobbing machine. Designed for hobbing cast-iron gears, using carbide-tipped hobs.

Circle 301 on Inquiry Form, page 119, for more data

TIMING CHAIN SPROCKETS—Hobbing of teeth. New application—built for Chevrolet Motor Div., GMC, in connection with production of Chevrolet V-8 engine. Barber-Colman No. 14-15 Hobbing machine.

Circle 302 on Inquiry Form, page 119, for more data

TIMING GEARS—Hobbing of teeth. Added efficiency as much as 400 per cent above other machines. Barber-Colman No. 14-15 High-Speed Hobbing machine. Designed for hobbing phenolic gears, using carbide-tipped hobs.

Circle 303 on Inquiry Form, page 119, for more data

FLYWHEEL RING GEARS—Hobbing of teeth. Approximate increase in production 50 per cent. Barber-Colman No. 20-15 Hobbing machine. Designed to cut several gears in a single loading, using multiple-thread hobs.

Circle 304 on Inquiry Form, page 119, for more data

CYLINDER BLOCKS — Honing cylinder bores. Plugmatic bore-to-bore sizing has substantially increased machining efficiency and accuracy. Barnes-driL Model 320 honer.

Circle 305 on Inquiry Form, page 119, for more data

CONNECTING RODS—Grinding mating surfaces of rods and caps. Output 600 rods and 600 caps per hour. Blanchard Two-Spindle Automatic Surface grinder. Workpieces are automatically unloaded.

Circle 306 on Inquiry Form, page 119, for more data

OIL PUMP COVERS—Grinding inner side, stock removal 0.060 in. Output 600 covers per hour. Blanchard Two-Spindle Automatic Surface grinder.

Circle 307 on Inquiry Form, page 119, for more data

FUEL PUMP BODIES AND COVERS—Multiple-spindle drilling and tapping. Added efficiency 20 to 60 per cent over single-fixture machine. Bodine 48-30 Dial Type machine.

Circle 308 on Inquiry Form, page 119, for more data

CARBURETOR BODIES — Multiple-spindle drilling and tapping. Added efficiency 25 to 60 per cent over single-fixture machine. Bodine 48-30 Dial Type machine.

Circle 309 on Inquiry Form, page 119, for more data

CARBURETOR SHAFTS—Milling, drilling, and tapping. Added efficiency 40 to 70 per cent over separate operations. Bodine 42-30 Dial Type machine.

Circle 310 on Inquiry Form, page 119, for more data

CYLINDER BLOCKS——Milling, cylinder boring, washing, assembly of bearing caps, camshaft bores finish-machined, crankshaft bores semi-finished, oil slinger grooves generated, and crankshaft thrust faces finished. Workpiece is a cast-iron four-cylinder-engine block. Cross Transfer-matic has six sections, four of which have a total of 113 stations.

Circle 311 on Inquiry Form, page 119, for more data

CONNECTING RODS — Drilling, core-drilling, chamfering, broaching (instead of reaming), and burnishing of piston pin holes. Four rods are processed at the same time. Production rate is over 500 rods per hour at 80 per cent efficiency. Finishing teeth on broach are followed by two ball burnishers. Tolerance of finished hole is within ±0.0007 in. Cross Dial Type machine has six stations.

Circle 312 on Inquiry Form, page 119, for more data

RADIATOR HEADERS—Stamping. Added efficiency 100 per cent. Danly Transfer Feed press.

Circle 313 on Inquiry Form, page 119, for more data

ROCKER ARM COVERS—Stamping. Added efficiency 100 per cent. Danly Transfer Feed press.

Circle 314 on Inquiry Form, page 119, for more data

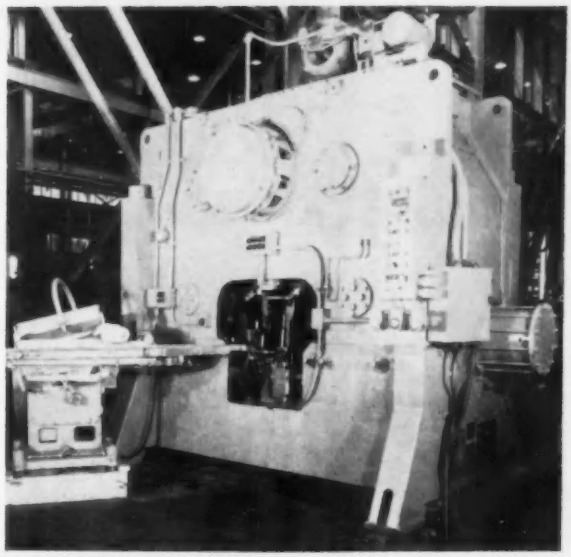
FUEL PUMP BODIES AND COVERS, DIESEL—Finish boring and plunge facing. Net production rate 174 pieces per hour. Tooling is so arranged that, with minor adjustments, either bodies or covers can be processed two per cycle on same machine. Ex-Cell-O Model 751 Single-end precision boring machine. Bulletin 316019.

Circle 315 on Inquiry Form, page 119, for more data

CYLINDER BLOCKS, DIESEL—Cylinder boring. Ingenious shuttle transfer arrangements are incorporated in machine for accepting and indexing all three engine sizes—6, 8, and 12-cylinder. Ex-Cell-O Custom Transfer machine. Bulletin 50155.

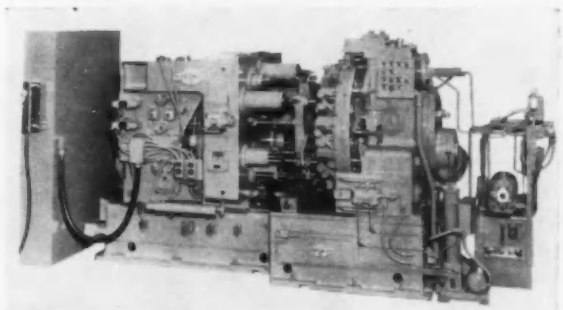
Circle 316 on Inquiry Form, page 119, for more data

CYLINDER BLOCKS—Boring and counterboring, and facing of crankshaft thrust surfaces. Crankshaft boring bar is fed in rapidly to operating position within the cylinder block. Hydraulically operated tools then are fed outwards from this bar to



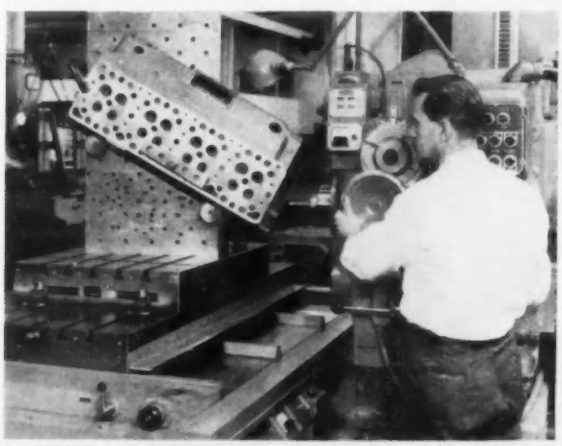
PISTON PINS—Cold extrusion. Added efficiency 100 per cent over prior methods. Danly Dual Slide Extrusion press, Type H2-100.

Circle 319 on Inquiry Form, page 119, for more data



OIL PUMP BODIES—Drilling, chamfering, boring, and reaming. Production 112 pieces per hour at 100 per cent efficiency; 90 pieces per hour at 80 per cent efficiency. Workpiece is of cast-iron, for an automobile engine. Greenlee One-Way 12-station Automatic indexing machine.

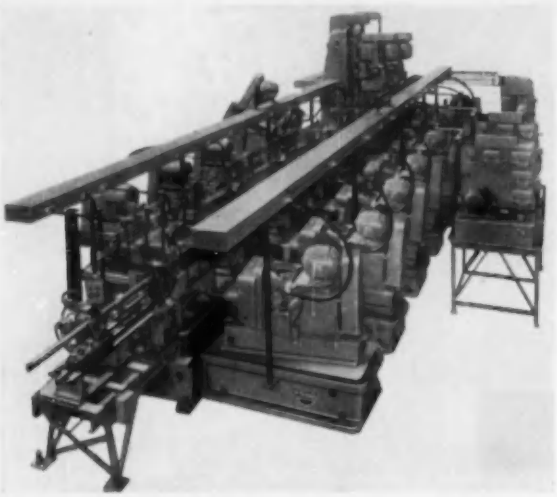
Circle 320 on Inquiry Form, page 119, for more data



CYLINDER HEADS—Boring and milling, experimental and small-lot production. Added efficiency 40 to 200 per cent over conventional horizontal boring machines and jig borers. DeVlieg SPIRAMATIC JIGMIL equipped with DIATROL Direct Dial Dimensioning System, and with index table which permits boring and milling of parts on several surfaces in one setup.

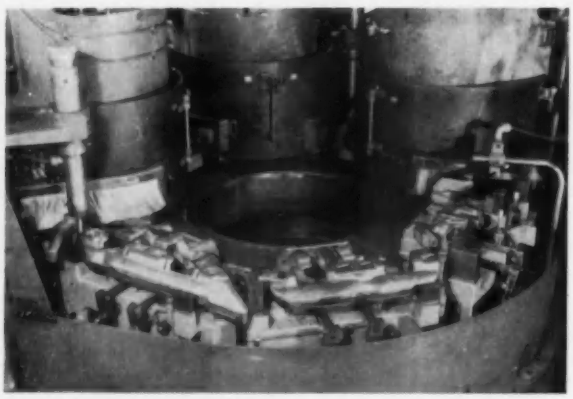
Circle 321 on Inquiry Form, page 119, for more data

Making ENGINE Production *PAY*



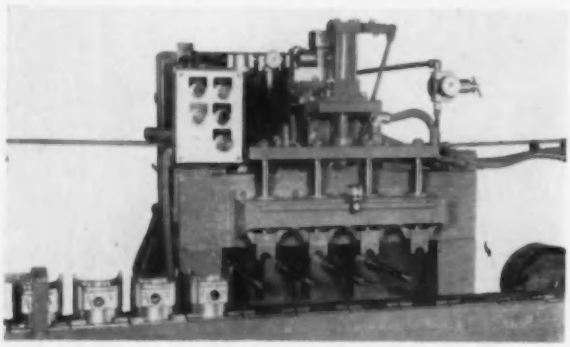
CYLINDER HEADS—Drilling, spotfacing, and chamfering. Handled by W. F. and John Barnes 21-Station Progress Thru Type machine illustrated. This maker's machines are single-purpose, custom-built units for drilling, tapping, boring, and milling operations. Added efficiency varies from 25 to 100 per cent.

Circle 337 on Inquiry Form, page 119, for more data



EXHAUST MANIFOLDS—Grinding faces, stock removal about 1/8 in. Output 200 manifolds per hour. Blanchard three-spindle automatic surface grinder. Each fixture station will accept either a right-hand or left-hand manifold.

Circle 338 on Inquiry Form, page 119, for more data



PISTONS—Automatic sizing and finishing of piston pin holes. Four pistons are given 4 to 7 microinch surface finishes and sized within 0.0001 in., in eight seconds, by Cogsdill Bearingizing tools mounted in this Hole Engineering Service machine.

Circle 339 on Inquiry Form, page 119, for more data

face thrust surfaces. Both four and six-cylinder engine blocks. Ex-Cell-O Custom Vertical Cylinder Boring machine. Bulletins 505911, 50155, and 27453.

Circle 322 on Inquiry Form, page 119, for more data

CYLINDER HEADS—Bore-Drilling of valve guide holes, and plunge-facing valve seats. Net production rate is 23 cylinder heads per hour. Machine Bor-Drills valve guide holes from the solid. Ex-Cell-O model 752 Precision Boring machine equipped for Bor-Dril application. Bulletins 311162 and 316019.

Circle 323 on Inquiry Form, page 119, for more data

CYLINDER HEADS—Bor-Drilling, reaming, and facing. Gross production 76 cylinder heads per hour, Operations are semi-finish Bor-Drilling from the solid and facing, and finish Bor-Reaming and facing of valve guide holes and valve seats in an automated 10-station setup. Ex-Cell-O Custom Transfer machine. Bulletins 311162, 50155, and 505911.

Circle 324 on Inquiry Form, page 119, for more data

VALVES, DIESEL—Contouring, facing, turning, and taper turning. Production, two at a time, at the rate of 140 per hour. Face of valve and curved surface under head are generated. Cutting speed of contouring tool in generating curved surface is held constant by variable-speed spindle motor controlled by a cam-operated rheostat. Ex-Cell-O Model 312 Cam-Operated Precision Boring machine. Bulletin 31751.

Circle 325 on Inquiry Form, page 119, for more data

ROCKER ARM SHAFT BRACKETS—Finish boring. Production four parts at a time, for a net production rate of 822 parts per hour. Machine bores two holes at 90 deg. Limits on diameters are ±0.0005 in. Ex-Cell-O Three-Way Precision Boring machine. Bulletin 312081.

Circle 326 on Inquiry Form, page 119, for more data

VALVE LIFTER BODIES—Finish boring (one machine), and hollow-milling (second machine). One machine finish-bores a blind hole 9/16 in. diam and 1 in. long, at the net production rate of 824 pieces per hour. Other machine hollow-mills an area at the closed end of part 7/8 in. diam and 5/8 in. long, at the net rate of 960 per hour. Ex-Cell-O Model 751 Single-end Precision Boring Machines. Bulletin 316019.

Circle 327 on Inquiry Form, page 119, for more data

PISTONS—Boring and elliptical turning (including piston pin bore grooving and gaging). Net production over 250 pistons per hour. Ex-Cell-O Vertical Piston Turning machines and associated Ex-Cell-O boring machines built into an automated transfer line. Bulletins 50155 and 505911.

Circle 328 on Inquiry Form, page 119, for more data

PISTONS—Cam turning. Gross production 106 parts per hour. Turns skirt to an elliptical contour

while, at the same time, the ring lands are being turned to a true diameter. Ex-Cell-O Model 751 Precision Boring machine. Bulletin 316019.

Circle 329 on Inquiry Form, page 119, for more data

PISTON RINGS—Finish boring inside diameter. Rings are bored at the rate of thousands per hour, varying in quantity with width of ring. Rings are compressed and loaded into spools having same ID as cylinder in which they are to be used. Each spool holds from 42 to 69 ring. Ex-Cell-O Model 751 Single-end Precision machines. Bulletin 316019.

Circle 330 on Inquiry Form, page 119, for more data

CONNECTING RODS — Boring of crankpin and piston pin holes. Two rods bored at a time, and gross production is 116 pieces per hour. Ex-Cell-O Model 751 Single-end Precision Boring machine. Bulletin 316019.

Circle 331 on Inquiry Form, page 119, for more data

CRANKSHAFTS—Turning, facing, boring, drilling, probing, tapping, and milling. Production rate 200 crankshafts per hour in a rapid 37-sec cycle. Ex-Cell-O Custom Transfer machine, 18 stations, nearly 40 ft long. Bulletins 50155 and 505911.

Circle 332 on Inquiry Form, page 119, for more data

VALVE ROCKERSHAFT BEARINGS — Rough and finish boring. Gross production nearly 900 parts per hour. Parts are machined four at a time in a semi-automatic setup. Ex-Cell-O Model 751 Single-end Precision Boring machine. Bulletin 316019.

Circle 333 on Inquiry Form, page 119, for more data

FLYWHEEL HOUSING AND TRANSMISSION CASE—Boring, facing, chamfering, milling, drilling, tapping, and trepanning. Production 125 parts per hour. Workpiece is an aluminum transmission case and flywheel housing combined. Ex-Cell-O Custom 24-station Transfer machine. Bulletins 50155 and 505911.

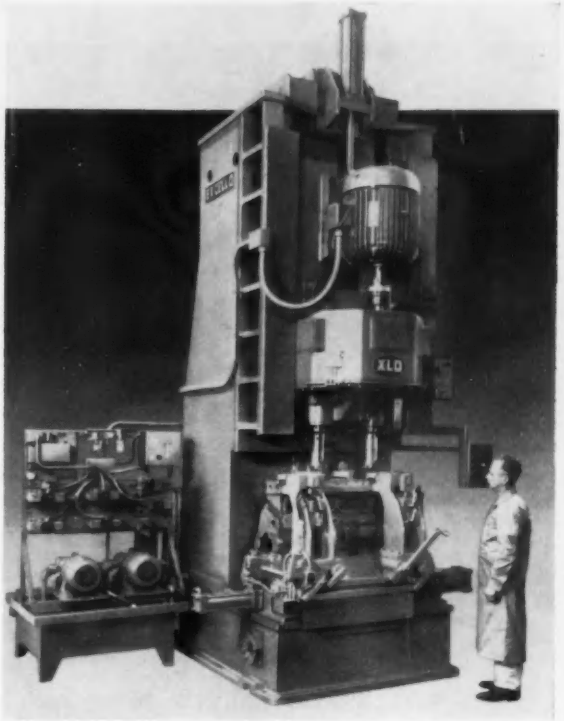
Circle 334 on Inquiry Form, page 119, for more data

FUEL METERING DRUM CAMS, AIRCRAFT—Cam milling, three-dimensional contours. Numerically-controlled machining improves production lead time and quality. Cams formerly produced on jig borer and finished by skilled hand-blending required 10 days to produce. New method reduced time to 8 hours per cam. Ex-Cell-O Numera-Trol Cam Milling machine. Bulletins B-5917 and 5060125.

Circle 335 on Inquiry Form, page 119, for more data

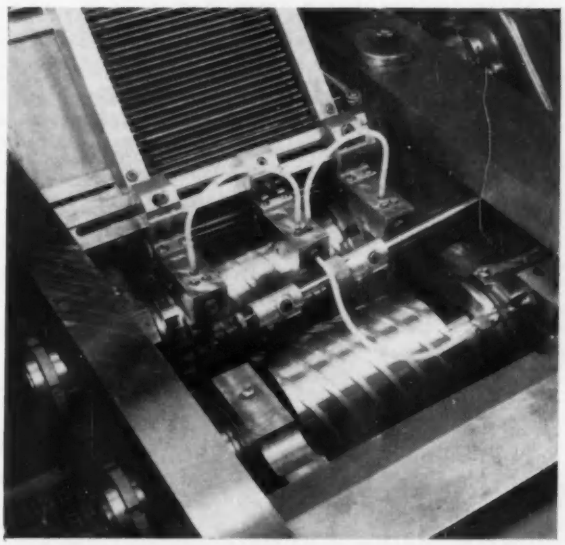
FUEL METERING PART, AIRCRAFT—Electrical discharge machining. Production time reduced to 8 minutes, from 40 minutes, per piece. This small part was formerly end-milled with a tiny cutter. Tool mortality was high, accuracy was unreliable, and the high-nickel-alloy material work-hardened. Ex-Cell-O Model 244 Lectra-Form machine. Bulletin 436014.

Circle 336 on Inquiry Form, page 119, for more data



CYLINDER BLOCKS—Boring and counterboring. Good finish produced with a feed of over 6.5 ipm. Workpiece weighs 700 lb unmachined, and is for a six-cylinder truck engine. Ex-Cell-O Custom Vertical Cylinder Boring machine. Bulletins 505911, 50155 and 27453.

Circle 340 on Inquiry Form, page 119, for more data



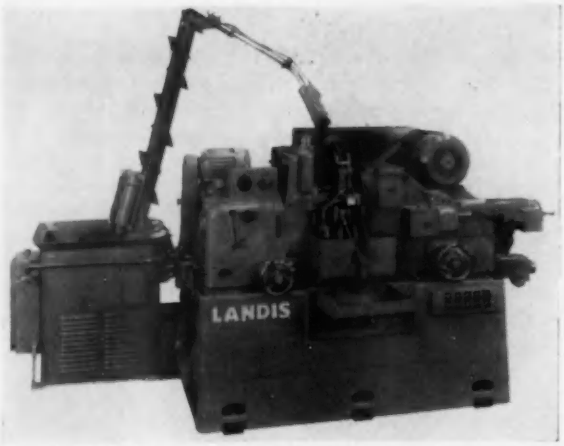
CYLINDER HOLD-DOWN STUDS — Automatic continuous thread-rolling of both ends (one machine); and roll-straightening (second machine). Production 75 parts per minute per machine. Material SAE 8640 steel. Two different workpiece lengths, 8-9/16 in. and 9¼ in. On one end of stud, thread is ⅜-in. diam, 16-pitch, AN, Class 5, 1-in. long. On other end, thread is ⅜-in. diam, 24-pitch, UNF, Class 2A, 21/32-in. long. In straightening operation, performed by second machine (illustrated), workpieces are consistently held to within 0.010 in. Landis Machine Co. 24PW LANHYROL Thread Rolling and Forming machines.

Circle 341 on Inquiry Form, page 119, for more data

Making ENGINE Production *PAY*

CRANKSHAFTS—Balancing. Setup measures amount and location of unbalance in each of two correction planes, indexes to exact angles for correction drilling, and then inspects for balance within ½ oz.-in. tolerance—in an automatic 10-step, 100-second cycle. Gisholt Automatic 2U Balancing machine.

Circle 361 on Inquiry Form, page 119, for more data



VALVES—Grinding diameter, including chamfer and groove on stem end, and carbon relief. Spaced wheels are profiled by a new rotary diamond dressing roll. Better form grinding results. Crush dressing can be incorporated. Automatic loading and unloading are also available. Landis Tool Co. 12R Centerless grinder.

Circle 362 on Inquiry Form, page 119, for more data

FUEL NOZZLES, JET ENGINE—Boring and contouring inside diameter. Net production 184 parts per hour. A surface finish of 12 microinches rms is obtained. Material is stainless steel. Ex-Cell-O Model 308 Cam-Operated Precision Boring machine. Bulletin 31751.

Circle 342 on Inquiry Form, page 119, for more data

MANIFOLDS, TRUCK ENGINE—Rough and finish milling, drilling, core-drilling, and chamfering. Gross production 133 manifolds per hour. Machine is comprised of both vertical and horizontal components, using building-block units wherever practical. Ex-Cell-O Custom 5-station Automatic Rotary Index machine. Bulletins 50155 and 505911.

Circle 343 on Inquiry Form, page 119, for more data

OIL AND WATER PUMP HOUSINGS—Deburring, cleaning, and buffing. Cycle time 10 to 12 minutes, capacity 200 to 1000 pieces per hour depending upon size. Drum of machine is 72 in. diam, 84 in. long. FENN-O-MATIC.

Circle 344 on Inquiry Form, page 119, for more data

CONVERTER HOUSING—Finish boring and facing. Gross production 86 parts per hour. Tolerance on 9 7/16-in. bore is held within 0.002 in. Ex-Cell-O Model 411 Vertical Precision Boring machine. Bulletin 506587.

Circle 345 on Inquiry Form, page 119, for more data

WATER PUMP BODIES—Straight boring, recessing and undercutting. Production 54 pieces per hour. Machine holds 0.0005 in. tolerance on bore diameter. Three similar water pump bodies bored with same machine and setup. Cam-controlled boring bar cuts contour on ID of part. Ex-Cell-O Model 732 Double-end Precision Boring machine. Bulletin 316018.

Circle 346 on Inquiry Form, page 119, for more data

OIL PUMP BODIES — Core-drilling, spotfacing, milling, drilling, reaming, and tapping, both semi-finished and finished. Net production 68 pieces per hour. Machine setup performs 11 operations. Parts are gray iron castings. Ex-Cell-O Custom 8-station Automatic Rotary Index machine. Bulletins 50155 and 505911.

Circle 347 on Inquiry Form, page 119, for more data

OIL PUMP IMPELLERS — Straddle facing. Net production 156 pieces per hour. Limits on width of impeller are held to within 0.0005 in. Machine equipped for completely automatic loading, machining, and ejecting of impellers. Ex-Cell-O Model 731 Single-end Precision Boring machine. Bulletin 316018.

Circle 348 on Inquiry Form, page 119, for more data

CARBURETOR BODIES — Boring. High production obtained, using two-place fixture on double-end machine. Machine bores four holes in carburetor flanges—some of aluminum, others of cast iron. Holes 1⅜ in. diameter are bored to ±0.0005 in. Ex-Cell-O Model 732 Double-end Precision Boring machine. Bulletin 316018.

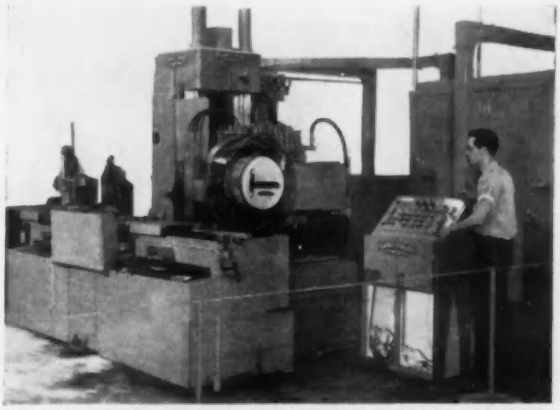
Circle 349 on Inquiry Form, page 119, for more data

FUEL INJECTOR PLUNGERS, DIESEL—Grooving, facing, boring, counterboring, chamfering, and generating a radius. Automatic work-handling equipment and four stations boosts production to 1200 parts per hour gross. Two machines used. Facing, grooving and chamfering operations are performed on one. Facing, boring, counterboring, chamfering, and generating a radius are performed on the other machine. Ex-Cell-O Model 312 Cam-Operated Precision Boring machines. Bulletin 31751.

Circle 350 on Inquiry Form, page 119, for more data

CONNECTING RODS—Grinding two sides of rod and cap. Production rate 375 each per hour. Automatic feed mechanism operates wheel feed screws to compensate for wheel wear as gaged by work sizers. When workpiece approaches high limit, machine feeds down to a predetermined amount from 0.0001 to 0.001 in. Mattison No. 72 Four-Spindle Rotary Automatic Grinder. Bulletin 147-2.

Circle 363 on Inquiry Form, page 119, for more data



FUEL INJECTOR BODIES, BLOWER MANIFOLDS, STARTER MOUNTING BRACKETS, AND WATER AND FUEL PUMP HOUSINGS, DIESEL ENGINES — Milling, drilling, boring, and related operations, including automatic tool changing. Machining efficiency increased upwards to 70 per cent. Automation permits more than 70 per cent machine utilization in making parts. Kearney & Trecker Milwaukee-Matic numerically-controlled machine. Bulletins WS-59 and AP-60.

Circle 364 on Inquiry Form, page 119, for more data

CYLINDER BLOCKS—Drilling, gun boring, reaming, probing, and tapping. Production 135 pieces per hour at 100 per cent efficiency; 101 pieces per hour at 75 per cent efficiency. Workpiece is of aluminum alloy, and for a V-8 automobile engine. Greenlee 18-station Automatic Transfer machine.

Circle 351 on Inquiry Form, page 119, for more data

CYLINDER BLOCKS—Drilling, chamfering, countersinking, probing, and reaming. Production 135 pieces per hour at 100 per cent efficiency; 102 pieces per hour at 75 per cent efficiency. Workpiece is of aluminum alloy, and for a V-8 automobile engine. Greenlee 21-station Automatic Transfer machine.

Circle 352 on Inquiry Form, page 119, for more data

CYLINDER BLOCKS—Drilling, gun boring, and tapping. Production 113 pieces per hour at 100 per cent efficiency; 90 pieces per hour at 80 per cent efficiency. Workpiece is either of cast iron or aluminum alloy, for a six-in-line automobile engine. Greenlee 26-station Automatic Transfer machine.

Circle 353 on Inquiry Form, page 119, for more data

CRANKSHAFTS, TRACTOR ENGINE—Drilling, centering, chamfering, and tapping. Production 59 pieces per hour at 100 per cent efficiency; 47 pieces per hour at 80 per cent efficiency. Workpiece is a steel forging. Greenlee Two-Way Horizontal 6-station Automatic Indexing machine.

Circle 354 on Inquiry Form, page 119, for more data

CONNECTING RODS—Boring, chamfering, and reaming. Production 960 pieces per hour at 100 per cent efficiency; 768 pieces per hour at 80 per cent efficiency. Workpiece is for an automobile engine. Greenlee 13-station Automatic Transfer machine.

Circle 355 on Inquiry Form, page 119, for more data

CONNECTING RODS AND CAPS—Drilling, countersinking, probing, milling, and reaming. Production 960 pieces per hour at 100 per cent efficiency; 768 pieces per hour at 80 per cent efficiency. Workpiece is for an automobile engine. Greenlee 10-station Automatic Transfer machine.

Circle 356 on Inquiry Form, page 119, for more data

PUMP ROTORS—Grinding. Production 545 parts per hour at 100 per cent efficiency. Two cuts required. Material powder metal. Gardner Model 2H30, 30 in. Rotary Carrier Double Disk grinder. Catalog D-60.

Circle 357 on Inquiry Form, page 119, for more data

CONNECTING RODS—Grinding. Production 800 pieces per hour at 100 per cent efficiency. Gardner Model 2H40, 42 in. Rotary Carrier Double Disk grinder. Catalog D-60.

Circle 358 on Inquiry Form, page 119, for more data

PISTON RINGS (Large)—Grinding. Rings range in size from 9 to 32 in. OD and from ⅛ in. to 1 in. thick. Grinding cycles: 20.68-in. rings, 45 sec roughing cut, 15 sec finish cut; 30-in. rings, 53 sec roughing cut, 18 sec finish cut. Gardner Model 2H30 Double Disk grinder, with special fixturing. Catalog D-60.

Circle 359 on Inquiry Form, page 119, for more data

HYDRAULIC VALVE LIFTER BODIES—Grinding. Production 3000 per hour, one end only, at 100 per cent efficiency. Machine is equipped with hopper feed, transfer attachment, automatic loading and unloading, rotary carrier, and two sizing units with automatic feedback. Gardner Model 723 Dual Horizontal Spindle Disk grinder.

Circle 360 on Inquiry Form, page 119, for more data

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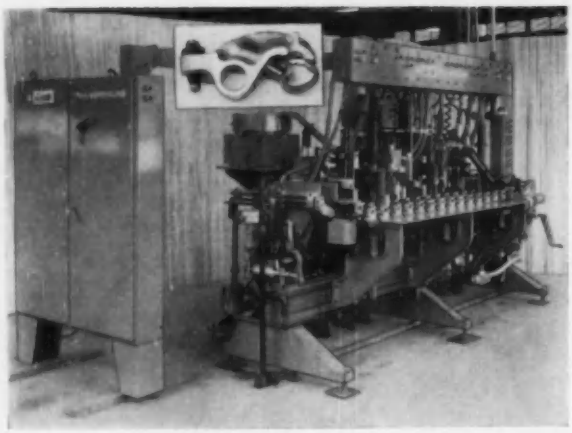
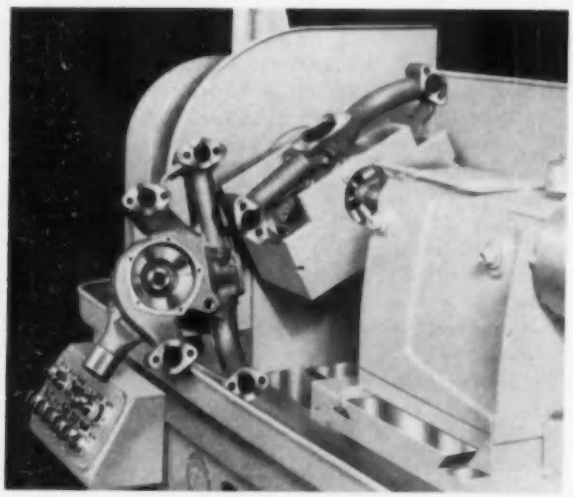


ROCKER ARMS—Assembling automatic valve adjusters (Ford). Production 1200 assemblies per hour, gross. Automatic operations include: load rocker arm; check rocker arm; hopper and run in ball-ended screw to fixed height ±0.010 in.; hopper, load and torque nut; rotate arm in fixture to facilitate completion of assembly; hopper and load spring; hopper and load retainer; check spring and retainer; hopper, load and check eccentric cam; complete assembly by hoppering, loading and pressing 1/16-in. diam roll pin; and auto-unload completed assemblies, diverting any incompleted assemblies. Gilman 16-station 6-in. TRANSFERLINE Assembly machine.

Circle 380 on Inquiry Form, page 119, for more data



WATER PUMP HOUSINGS—Finishing seal faces. Production 60 parts per hour at 80 per cent efficiency. Finish 8 microinches rms. Gisholt Model 51 Superfinisher, with special box-type fixture (designed for handling more than nine different part styles) mounted on spindle for centralizing, locating, holding, and driving.

Circle 381 on Inquiry Form, page 119, for more data

CONNECTING RODS—Assembling of rods and caps. Production 1200 assemblies per hour, gross. Automatic operations performed are: check bolt holes and bearing lock grooves; hopper, load and press lightly two bolts; press two bolts to seated positions with up to 20,000 lb force; check two bolts; hopper, load and run-on two nuts to within one or two threads of seating; torque two nuts; and auto-unload completed assemblies, diverting any incompleted assemblies. Gilman 10-station 9-in. TRANSFERLINE Assembly machine.

Circle 365 on Inquiry Form, page 119, for more data

ROCKER ARMS—Assembling inserts in ends of die-cast aluminum parts (Buick). Production 1440 assemblies per hour, gross. Automatic operations include: load rocker arm; check part for presence, proper loading, and whether right-hand or left-hand piece; hopper, load and press insert; hopper, load, press, and stake seat; check for flaws with 1200-lb load; check assembly; and auto-unload, separating right and left-hand pieces, and diverting any incomplete assemblies. Gilman 12-station 6-in. TRANSFERLINE Assembly machine.

Circle 366 on Inquiry Form, page 119, for more data

CYLINDER HEADS—Drilling, chamfering, countersinking, reaming, and tapping. Production 30 pieces per hour at 100 per cent efficiency; 24 pieces per hour at 80 per cent efficiency. Workpiece is a cast-iron cylinder head for a six-cylinder Diesel. Greenlee 21-station Automatic Transfer machine.

Circle 367 on Inquiry Form, page 119, for more data

ROD PISTONS—Thread cutting. In this application, the die head and chasers have given sizable cost savings. Produced is a 1-in., 14-pitch, UN, Class 2A thread. Die head is mounted on a No. 4 Warner & Swasey Turret lathe. Landis Machine Co. 10F LANDMATIC Heat-Treated Die Head.

Circle 368 on Inquiry Form, page 119, for more data

BOLTS, DIESEL ENGINE—Thread cutting. Despite the difficult-to-machine aspects of material (heat-treated beryllium-copper non-magnetic), 200 bolts (8-hour production) were obtained between chaser grinds. Produced is a 5-16-in., 18-pitch, UN, 7/8-in.-long, Class 2A thread. Die head is mounted on a No. 3 Ram Type Warner & Swasey Turret lathe. Landis Machine Co. 7H Hardened and Ground LANDMATIC Die Head.

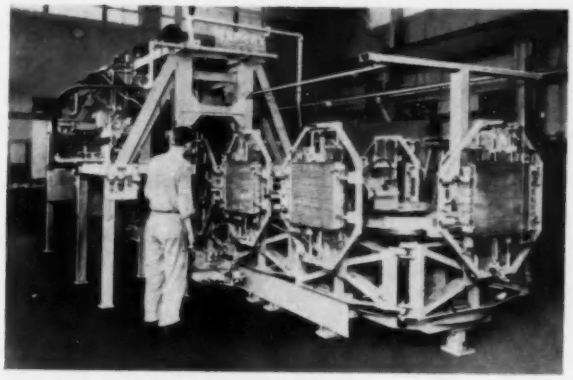
Circle 369 on Inquiry Form, page 119, for more data

CRANKSHAFTS—Grinding crankpins. Added efficiency 40 per cent over Type DH Semi-Automatic machine. Crankshaft is automatically indexed "on the fly" after each pin has been ground. Other features of machine include automatic locating which aligns shaft with grinding wheel, wedge work-rest, sizing gage and Landis Microfeed which feeds the wheel base in increments of 50 millionths, after spark-out, until final size is reached. Landis Tool Co. Automatic Crankpin grinder.

Circle 370 on Inquiry Form, page 119, for more data

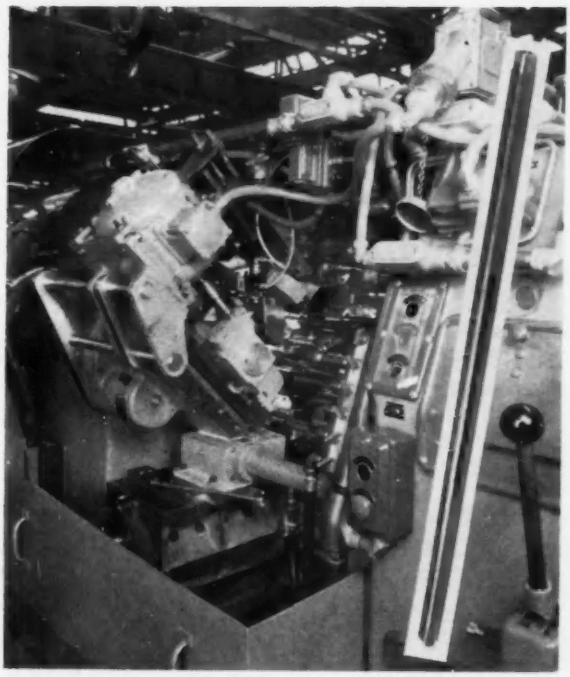
CRANKSHAFTS—Grinding main bearings. Added efficiency 20 per cent over Type HIW machine. Parts are ground automatically to finish size as indicated by automatic sizing. Machine includes Landis Microfeed, front-of-wheel dressing, automatic work rest, loaded ball spindle footstock for improved work center stability. Landis Tool Co. IWR Multiple Wheel grinder.

Circle 371 on Inquiry Form, page 119, for more data



RADIATOR ASSEMBLIES—Soldering. Production 206 assemblies per hour at 80 per cent efficiency. Quality control standards call for a minimum 0.200 in. depth of solder penetration on radiator tank joints, and a minimum 2½ in. square area of solder penetration under lap joints on side support brackets. Expert Automatic Radiator Soldering machine.

Circle 382 on Inquiry Form, page 119, for more data



CARBURETOR SHAFTS—Facing, drilling, tapping, and slotting. Added efficiency 75 per cent over prior practice. National Acme Co. 1¼-in. RB-8 Acme-Gridley Carburetor Shaft machine.

Circle 383 on Inquiry Form, page 119, for more data

U-BOLTS — Thread-rolling, and pointing. Workpiece lengths range from 12½ in. to 38 in.; and thread lengths from 1⅛ in. to 3¼ in. Five thread specifications, ranging from ⅜-in. diam, 24-pitch, NF, Class 2; to ¾-in. diam, 16-pitch, UNF, Class 2A. Production on ⅜-in. diam is 90 per minute, both ends threaded and pointed. Production on ¾-in. diam over 24 in. long is 44 threaded ends per minute, or 22 completed pieces per minute. Landis Machine Co. 24PW LANHYROL "Extended-Extended Spindle" Thread Rolling and Forming machine.

Circle 384 on Inquiry Form, page 119, for more data

PISTON PINS—Grinding OD. Added efficiency 10 per cent over No. 12 machine. Main results are higher quality, increased production, and improved machine reliability. Landis Tool Co. 12R Centerless grinder.

Circle 372 on Inquiry Form, page 119, for more data

CAMSHAFTS — Grinding bearings. Added efficiency 10 per cent over Type HIW machine. In addition to a carriage reciprocating mechanism, machine includes Landis Microfeed, front-of-wheel dressing, automatic work rest, loaded ball spindle footstock for improved work center stability. Parts are ground automatically to finish size as indicated by automatic sizing. Landis Tool Co. IWR Multiple Wheel grinder.

Circle 373 on Inquiry Form, page 119, for more data

PISTON PINS—Grinding both ends. Production rate more than 1300 per hour. Finish 20 microinches. Automatic loading and sizing. Mattison No. 221 Double Disk grinder.

Circle 374 on Inquiry Form, page 119, for more data

TIMING GEAR HOUSINGS, DIESEL ENGINE—Rough grinding, and finish grinding on both sides. Production increased from 5 to 12 parts per hour. Workpiece formerly milled. Part is first rough-ground to within 0.010 in., and then finish-ground on same machine. Seven castings can be finished in one setup on magnetic table. Mattison No. 400-SS Vertical-Spindle Reciprocating-Table Surface grinder.

Circle 375 on Inquiry Form, page 119, for more data

PUMP GEARS—Cutting all teeth simultaneously. Output 10 to 16 times that of conventional gear shapers. Michigan 1800 Series Shear-Speed Gear Shaper. Bulletin SS-55.

Circle 376 on Inquiry Form, page 119, for more data

CRANKSHAFTS — Grinding front or rear ends. Added efficiency 20 per cent over Type CH machine, with higher quality. Landis Tool Co. Type R Plunge grinder.

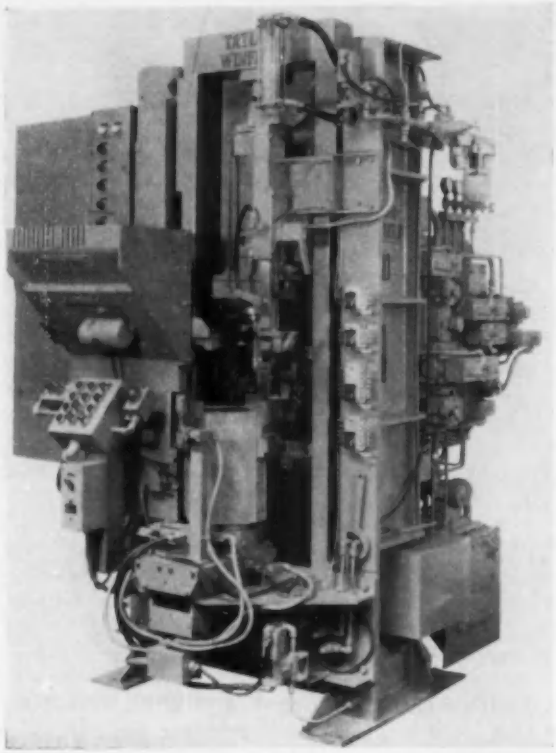
Circle 377 on Inquiry Form, page 119, for more data

SHOULDER GEARS—Abrasive finishing. Permits designing gear teeth closer to shoulders. Michigan 999 Abrasive Finisher. Bulletin 999-60.

Circle 378 on Inquiry Form, page 119, for more data

CONNECTING RODS — Stack-Microhoning of crankpin and piston pin bores. Added efficiency 20 per cent over Model 710-4 vertical, four-spindle machine. Quality also improved. Machine stack-Microhones eight connecting rods at one time, while second fixture on index table is in unload-load position. (Same horizontal-stack principle can be applied to Microhoning of pinion gears and other bores with short lengths in relation to diameters.) Micromatic Single-Spindle Horizontal Model 5HXH16 Hydrohoner.

Circle 379 on Inquiry Form, page 119, for more data



INTAKE VALVES—Hot-heading blanks. Production rate 250 per hour. Material Silchrome #1 steel rod, 0.346 in. diam. Automatic hopper feeding of rods, rotary transfer mechanism, and air-operated pick-off device. Taylor-Winfield Special VRH-5 Resistance-Heating Gathering machine.

Circle 406 on Inquiry Form, page 119, for more data

BEARING CAPS, DIESEL ENGINE—Broaching both sides, bolt head seats, upper bearing lock, half bore, joint faces, and lower bearing lock width. Production 80 pieces per 48-minute hour. Material malleable iron; stock removal ¼ in. Machine equipped with tooling for four basic group sizes of bearing caps. Capable of handling 13 different sizes of caps. Cincinnati Special Two-Way Horizontal Hydraulic Bearing-Cap Broaching machine.

Circle 385 on Inquiry Form, page 119, for more data

EXHAUST MANIFOLDS — Milling of mounting face, drilling 11 mounting holes, and finish-broaching of mounting face. Production 114 pieces per 48-minute hour. Material is cast iron. Stock removal 3/16 in. milling, 0.010 in. broaching. Machine has five-spindle ram type milling head; drill head containing 11 drilling tools; drill head having four tools (two drills and two reamers); broaching head; indexing table and hydraulic clamping fixtures; building-block design. Cincinnati Special 72-in. 90-deg Index machine.

Circle 386 on Inquiry Form, page 119, for more data

WATER PUMP SHAFTS—Grinding ball grooves. Production four-times that of predecessor machine. Cincinnati No. 1 Chucking grinder.

Circle 387 on Inquiry Form, page 119, for more data

PISTONS — Elliptical grinding skirt. Production 80 parts per 60-minute hour. Material is aluminum. Stock removal 0.043 in. minor diameter, 0.010 in. major diameter. Finish 40 to 80 microinches. Tolerance on diameter 0.0002 to 0.0003 in. Machine is completely automatic, operated from pushbutton panel; and has in-process gaging with automatic compensation. Cincinnati Special Automatic Piston Relief Grinder.

Circle 388 on Inquiry Form, page 119, for more data

CYLINDER BLOCKS—Milling starter pad, fuel pump pad, and distributor face. Production 20 parts per 48-minute hour. Material cast iron. Stock removal approximately ¼ in. Machine handles four sizes of blocks; and was designed to fit customer's conveyor system. Cincinnati Special Low-Bed Milling machine.

Circle 389 on Inquiry Form, page 119, for more data

CYLINDER BLOCKS—Rough milling and finish milling ends. Production 17 parts per 48-minute hour. Material cast iron. Stock removal in roughing approximately ¼ in., and in finishing 0.015 in. Machine has completely automatic cycle; and handles four sizes of blocks. Cincinnati Special Low-Bed Duplex Milling machine.

Circle 390 on Inquiry Form, page 119, for more data

CYLINDER BLOCKS — Finish-milling top. Production 19 parts per 40-minute hour. Material cast iron. Stock removal 0.015 in. Machine accommodates four sizes of blocks; and was designed to fit customer's conveyor system. Cincinnati Special Low-Bed Vertical Milling machine.

Circle 391 on Inquiry Form, page 119, for more data

CYLINDER BLOCKS—Finish-broaching of bearing lock, pad and clearance. Production 40 parts per 48-minute hour. Material cast iron. Stock removal 0.010 in. Four part sizes. Machine has completely automatic cycling; and was designed to work from customer's conveyor line. Cincinnati Special Horizontal Broach.

Circle 392 on Inquiry Form, page 119, for more data

PISTONS, Finish turning, grooving, and facing. Added efficiency 5 per cent over prior practice. National Acme Co. 6-in. RPA-8 Piston Finishing machine.

Circle 393 on Inquiry Form, page 119, for more data

CYLINDER BLOCKS—Rough-milling of pan rail, bearing lock, bearing pad, and clearance; finish-milling of pan rail; rough and semi-finish top. Production 13 parts per 48-minute hour. Material cast iron. Stock removal in roughing approximately ¼ in., and in finishing 0.015 in. Machine has completely automatic machining cycle in both directions. Cincinnati Special Low-Bed Duplex Milling machine.

Circle 394 on Inquiry Form, page 119, for more data

PISTONS—Rough turning and facing. Added efficiency 15 per cent over prior practice. National Acme Co. 6-in. RPA-8 Scalping machine.

Circle 395 on Inquiry Form, page 119, for more data

TURBINE WHEELS, AIRCRAFT—Profile-milling blade contour. Part is a steel forging, integrally-bladed. The 360-deg tracer controls rotation of workpiece and "in" and "out" movement of ram. Depth tracer is automatically fed up on tracer brackets to provide continuous automatic downfeed as it follows root contour master. An additional depth tracer provides table offset to avoid interference of cutter shank and blade tip. Cincinnati 16/30 Vertical Hydrotel Milling machine.

Circle 396 on Inquiry Form, page 119, for more data

CAMSHAFTS—Turning, chamfering, and facing. Added efficiency 50 per cent over prior practice. National Acme Co. 8-in. RPA-6 Camshaft machine.

Circle 397 on Inquiry Form, page 119, for more data

VALVES—Turning, facing, and machining seat. Added efficiency 9 per cent over prior practice. National Acme Co. 1⅝-in. RAS-4 Valve machine.

Circle 398 on Inquiry Form, page 119, for more data

CONNECTING RODS — Boring and chamfering holes. Added efficiency 20 per cent. Heald Model S Biway, Auto-Load Bore-Matic.

Circle 399 on Inquiry Form, page 119, for more data

TIMING GEARS—Hobbing of teeth. High production with minimized downtime. Michigan 1458-B Hobber. Bulletin 1458-B.

Circle 400 on Inquiry Form, page 119, for more data

CRANKSHAFTS—Grinding crankpins. Added efficiency 15 per cent over D-86 pin grinder. New machine eliminates downtime for wheel-truing. Gives accurate grinding wheel contour for grinding sidewalls and pin diameters. Reduces tendency to burn sidewalls because grinding wheel is supported between bearings. Norton CC-8 CRANK-O-MATIC Semi-Automatic Crankpin Grinding machine.

Circle 401 on Inquiry Form, page 119, for more data

CRANKSHAFTS—Grinding pulley end. Added efficiency 20 per cent over 10-in. angular wheel-slide machine. Two machine models. More consistent sizing, greater flexibility, simply arranged for automatic operation, and both give higher production with 8500 sfpm wheel speed. Norton 10-in. CV-4 Angular Wheelslide Grinding machine, and Norton CP-1 PLUNGE-O-MATIC Grinding machine.

Circle 402 on Inquiry Form, page 119, for more data

CAMSHAFTS—Grinding of cam contours. Added efficiency 6 to 8 per cent over No. 1 CAM-O-MATIC machine. Newer machine produces more accurate contours at a higher production rate through more-efficient completely-automatic machine cycling. Norton No. 3 CAM-O-MATIC Cam Grinding machine.

Circle 403 on Inquiry Form, page 119, for more data

FLYWHEELS, DIESEL ENGINE — Drilling, reaming, and counterboring. Numerically-controlled machine, employing General Electric Mark I control system. Fifteen different flywheels being processed at present, ranging in diameter from 12⅝ to 20 in. Punched tape indexes 34-in.-diam dial-type table and initiates automatic feed cycles for the four machining units. Snyder Numerically-Controlled Dial-Type Multi-Head Special machine.

Circle 407 on Inquiry Form, page 119, for more data

GEARS AND SHAFTS — Grinding diameters. Added efficiency 20 per cent over cylindrical and angular wheelslide grinders. Wheel speed of 8500 sfpm gives greater production. Norton 6 and 10-in. Type CTU, 10-in. Type CV-4, and Type CP-1 PLUNGE-O-MATIC Grinding machines.

Circle 404 on Inquiry Form, page 119, for more data

PISTON PINS—Slug shearing, slug heading, and extruding. Three machines. Production each machine 60 pieces per minute, 3600 per hour. Material carbon or alloy steel suitable for application, hot or cold finished, coil or bar stock. Savings in material 54 per cent over machining solid bar stock; 12 per cent over machining seamless tubing. Verson extrusion slug shear, consisting of Model 5B24SP press, including bar or coil stock feed and special box bushing shear die. Verson extrusion slug header, consisting of Model 6B30SP press, including dial type heading die, automatic loading and unloading, and hopper feed. Verson piston pin extrusion machine, consisting of Model EC-2-300-48T Transmat extrusion press and Transmat feed, extrude draw wipe and pierce die units, automatic slug checking and power hopper feed unit.

Circle 405 on Inquiry Form, page 119, for more data

CAMSHAFTS—Grinding of bearings. Added efficiency 10 per cent over CM Multiwheel grinder. Later-model machine has greater rigidity and improved sizing consistency. Norton CM Semi-Automatic Multi-Wheel Grinding machine.

Circle 408 on Inquiry Form, page 119, for more data

BREATHER TUBES—Forming by bending. Approximate added efficiency 185 per cent. Multi-bend breather tubes produced at the rate of 1700 bends per hour. Previously, same tubes were made on specially-built horizontal rotary machines at an estimated rate of 600 bends per hour. Pines High-Speed Model 3-T Hydraulic Bending Press. Catalog 379.

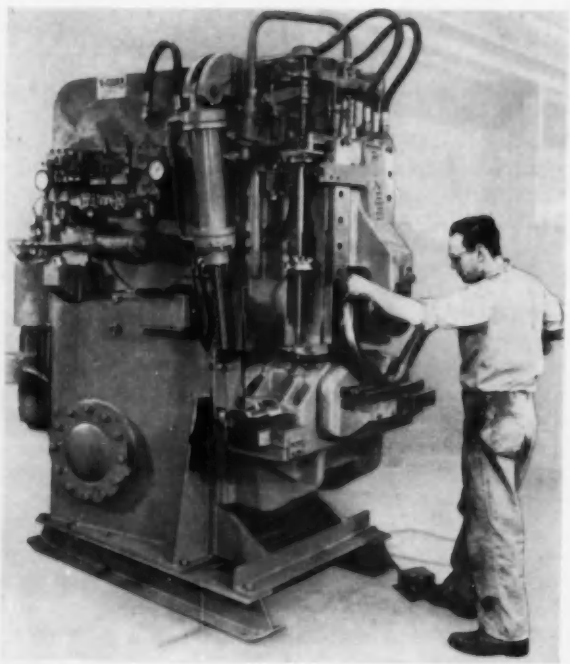
Circle 409 on Inquiry Form, page 119, for more data

CONNECTING RODS — Boring of piston pin holes. Precision boring head can be infinitely adjusted quickly in increments of 0.0001 in. by direct reading, without backlash. In application of special head, tolerance on diameter is 0.0003 in. DEKA BORE Boring Head.

Circle 410 on Inquiry Form, page 119, for more data

WATER PUMP HOUSINGS—Boring and turning. Accuracy and versatility of machine prime requisites. Irregularly-shaped difficult-to-grip part, requiring 0.001-in.-tolerance boring operations, close concentricities, and close face-to-shoulder lengths. Warner & Swasey 2AC and 3AC Single-Spindle Chucking Automatics.

Circle 411 on Inquiry Form, page 119, for more data



TAILPIPES—Forming of laminated tubing. Prior equipment could not produce acceptable bends in new laminated tailpipe. Pines Model 30-T Hydraulic Bending Press. Catalog 379.

Circle 425 on Inquiry Form, page 119, for more data

WATER PUMP HOUSINGS — Boring. Tolerance on bore diameter 0.001 in., with 0.0003 in. max out-of-roundness, in a bore length of over 3½ in. Warner & Swasey No. 4 Universal Ram Type Turret lathe.

Circle 412 on Inquiry Form, page 119, for more data

FAN AND ACCESSORY DRIVE HOUSINGS—Turning and boring. Multiple chuckings on cast-aluminum part. Tolerances of 0.001 and 0.002 in. are common. Warner & Swasey 3AC Single-Spindle Chucking Automatic.

Circle 413 on Inquiry Form, page 119, for more data

MISC. GRAY-IRON ENGINE CASTINGS—Batch-type airless blast cleaning. Cleaning approximately two to three times faster and costs reduced up to 75 per cent over other blast-cleaning machines. Wheelabrator Super Tumblast.

Circle 414 on Inquiry Form, page 119, for more data

CYLINDER BLOCKS — Airless abrasive blast cleaning for removing sand from castings. New machine replaced four standard monorail blast cabinets. Wheelabrator U-8 Monorail Cabinet.

Circle 415 on Inquiry Form, page 119, for more data

FLYWHEELS—Rough and finish facing, boring, and turning. Production 42 pieces per hour at 100 per cent efficiency. Motch & Merryweather Model 1V Vertical Turner.

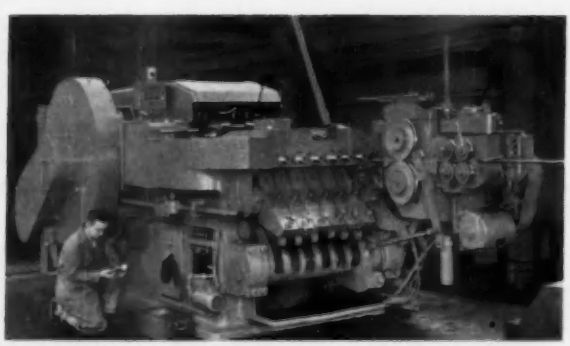
Circle 416 on Inquiry Form, page 119, for more data

FLYWHEEL HOUSINGS—Boring and facing. Production 85 pieces per hour at 100 per cent efficiency. Material is aluminum alloy. Motch & Merryweather Model IV Vertical Turner.

Circle 417 on Inquiry Form, page 119, for more data

CONNECTING RODS—Milling for weight standardization. Production about 240 pieces per hour. Motch & Merryweather Single-Station Weighing and Milling machine.

Circle 418 on Inquiry Form, page 119, for more data



PISTON PINS—Cold forming. Production rate 50 per minute. National Machinery Co. No. 1000 Seven-Station Cold Former.

Circle 426 on Inquiry Form, page 119, for more data

CAMSHAFTS—Rough and finish turning, side-facing, and chamfering of bearing diameters and gear diameter. Production exceeds 200 camshafts per hour at 80 per cent efficiency. Carbides used for roughing, cemented oxide tools for finishing operations. Automatic gaging. Two transfer lines of Sundstrand Automatic Lathes, each line comprising eight machines connected by automatic handling equipment for transfer, loading and unloading of workpieces.

Circle 419 on Inquiry Form, page 119, for more data

PISTONS—Facing dome, turning land diameters, and chamfering top. Production about 560 per hour. Motch & Merryweather Two-Spindle Vertical Turning machine.

Circle 420 on Inquiry Form, page 119, for more data

WATER PUMP BODIES—Milling to length. Production about 240 per hour. Motch & Merryweather Duplex Index Type machine.

Circle 421 on Inquiry Form, page 119, for more data

FLYWHEEL HOUSINGS — Milling both sides. Production about 120 per hour. Motch & Merryweather Duplex-Type Index-Table Milling machine.

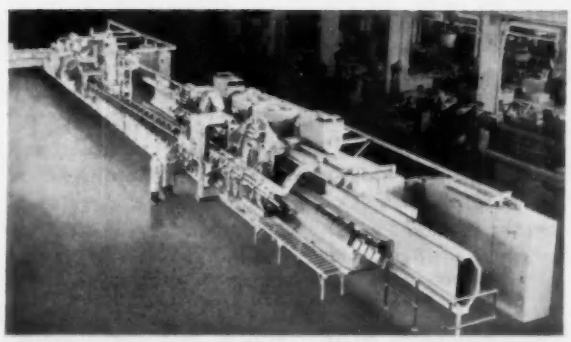
Circle 422 on Inquiry Form, page 119, for more data

FLYWHEEL RING GEARS — Cutting off rings from coils. Production about 400 per hour. Motch & Merryweather Plain No. 2 Sawing machine with special expanding and clamping fixture.

Circle 423 on Inquiry Form, page 119, for more data

CYLINDER BLOCKS, V-8 ENGINE — Multiple machining operations. Production rate about 80 parts per hour. Locating dowels are drilled and reamed; bearing faces are milled; starter and oil filter pads are rough and finish milled; mounting and clutch pads are milled; both ends are rough and finish milled; and oil galley spot-faced, as parts are automatically handled. Sundstrand 12-Station Process Line.

Circle 424 on Inquiry Form, page 119, for more data

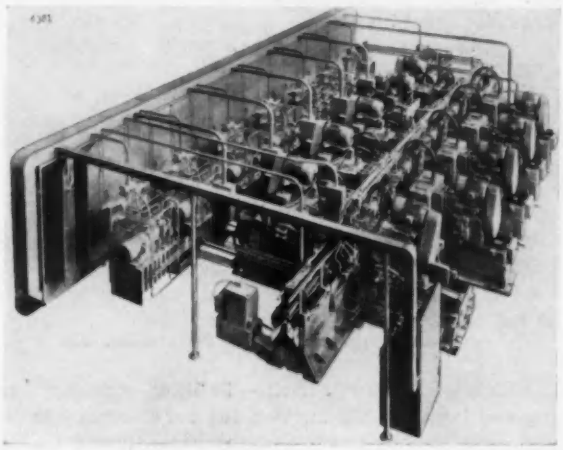


CYLINDER BLOCKS, TRUCK AND BUS—Broaching, milling, and drilling. New application. Cincinnati Special In-Line Broaching, Milling, and Drilling machine.

Circle 427 on Inquiry Form, page 119, for more data

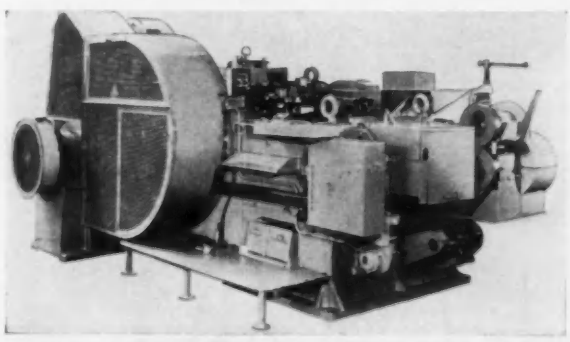
CARBURETOR BODIES—Impregnating castings. Production rate, with double-autoclave setup, approximately 720 four-barrel castings per hour, or 1050 two-barrel castings per hour. Process uses Perlox metal oxide sealant to seal machined aluminum carburetor body castings that are found leaking upon inspection. Prenco Products, Inc.

Circle 430 on Inquiry Form, page 119, for more data



CYLINDER HEADS—Boring and reaming of cam follower and injector holes, two, three and four-cylinder cast-iron Diesel heads. Production 37 pieces per hour at 100 per cent efficiency; 30 pieces per hour at 80 per cent efficiency. Greenlee 7-station Automatic Transfer machine.

Circle 429 on Inquiry Form, page 119, for more data



VALVE SPRING RETAINERS—Cold forming. Saving of material approximately 54 per cent over screw machine method. Waterbury Farrel Cold Nut Former. Circulars 930-A and 952-A.

Circle 428 on Inquiry Form, page 119, for more data

Making ENGINE Production *PAY*

CYLINDER BLOCKS — Microhoning main bearing bores. Added efficiency 15 per cent over boring. Workpiece is of die-cast aluminum; and bores are bi-metallic, being composed of an aluminum case and cast-iron bearing caps. Micromatic Model 5HX40 Single-Spindle Horizontal Hydrohoner.

Circle 451 on Inquiry Form, page 119, for more data

CYLINDER HEADS—Drilling, reaming, chamfering, spotfacing, counterboring, core drilling, and tapping. Production 103 parts per hour at 80 per cent efficiency. Foote-Burt 17-Station 64-Spindle Transfer machine.

Circle 457 on Inquiry Form, page 119, for more data

CRANKSHAFTS — Drilling, reaming, tapping, chamfering, and precision-boring. Production 78 per hour at 100 per cent efficiency. Snyder Special 20-Station Building-Block Transfer machine.

Circle 458 on Inquiry Form, page 119, for more data

CYLINDER BLOCKS—Drilling, reaming, tapping, boring, and chamfering. Production 131 per hour. Part is of cast aluminum. Lamb 12-Station In-line Transfer machine.

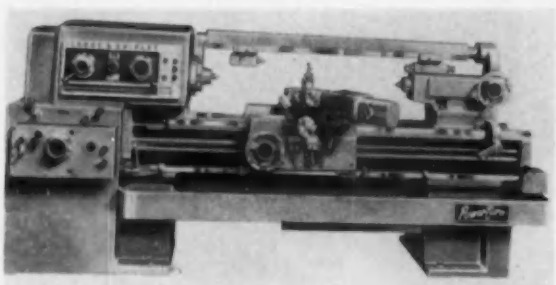
Circle 459 on Inquiry Form, page 119, for more data

FLYWHEEL HOUSINGS—Drilling, reaming, boring and tapping. Production 163 per hour at 100 per cent efficiency. Snyder Special Five-Station Center Column machine.

Circle 460 on Inquiry Form, page 119, for more data

FLYWHEELS—Drilling, reaming, counterboring and tapping. Fifty-four operations performed at six machining stations on two different flywheels. Natco Special Rotary-Type machine.

Circle 461 on Inquiry Form, page 119, for more data



TURBINE SHAFTS—Rough and finish turning of contour. Steep taper, and six different-size OD's. Material aluminum. Part is 12 in. max diam by 17 in. long. Cutting tool is carbide. Lodge & Shipley 2013 POWERTURN lathe with 45-deg tracer and four-way rapid traverse.

Circle 452 on Inquiry Form, page 119, for more data

FLYWHEELS—Boring and facing after assembly with ring gear. Production about 55 per hour. Motch & Merryweather Two-Spindle Precision Turning and Boring machine.

Circle 431 on Inquiry Form, page 119, for more data

CRANKSHAFTS—Milling to length and centering both ends. Production about 150 per hour. Motch & Merryweather No. 3 MCT Trunnion-Type Milling and Centering machine with automatic loading and unloading.

Circle 432 on Inquiry Form, page 119, for more data

CAMSHAFTS—Milling to length and centering to depth. Production about 240 per hour. Motch & Merryweather No. 3 MCT Trunnion-Type Milling and Centering machine with automatic loading and unloading.

Circle 433 on Inquiry Form, page 119, for more data

PISTON PINS—Cutting off to length. Production about 330 per hour. Motch & Merryweather No. 00-A Automatic Sawing machine.

Circle 434 on Inquiry Form, page 119, for more data

PISTON PINS—Cutting off to length. Production about 540 per hour. Motch & Merryweather No. 0-4 Automatic Sawing machine.

Circle 435 on Inquiry Form, page 119, for more data

PISTON PINS—Cutting off, drilling, reaming, facing, and chamfering. Production about 850 per hour. Combination Baker and Motch & Merryweather machine, built by Baker with M & M heads and bar feed.

Circle 436 on Inquiry Form, page 119, for more data

INTAKE MANIFOLDS—Milling mounting faces and carburetor face. Production about 75 per hour. Motch & Merryweather Special Table Type Milling machine.

Circle 437 on Inquiry Form, page 119, for more data

INTAKE MANIFOLDS — Milling all pads and mounting faces; drilling, reaming and tapping holes. Production about 75 per hour. Motch & Merryweather Special Transfer-Type Milling and Drilling machine.

Circle 438 on Inquiry Form, page 119, for more data

EXHAUST MANIFOLDS — Milling all pads and mounting faces; drilling, reaming and tapping holes. Production about 75 per hour. Motch & Merryweather Special Transfer-Type or Rotary-Table Milling and Drilling machine.

Circle 439 on Inquiry Form, page 119, for more data

CONNECTING RODS—Milling for weight standardization. Production about 290 pieces per hour. Motch & Merryweather Duplex-Type Weighing and Milling machine.

Circle 440 on Inquiry Form, page 119, for more data

CYLINDER BLOCKS—Rough and finish milling ends. Production about 100 per hour. Motch & Merryweather Four-Station Transfer-Type Milling machine.

Circle 441 on Inquiry Form, page 119, for more data

CYLINDER BLOCKS—Rough and finish milling ends. Production about 55 per hour. Motch & Merryweather Single-Station Traveling-Fixture-Table machine.

Circle 442 on Inquiry Form, page 119, for more data

CYLINDER BLOCKS—Rough and finish milling of bank faces. Production about 85 pieces per hour. Motch & Merryweather Four-Station Transfer-Type Milling machine.

Circle 443 on Inquiry Form, page 119, for more data

CYLINDER BLOCKS—Rough and finish milling of bank faces. Production about 55 per hour. Motch & Merryweather Single-Station Traveling-Fixture-Table machine.

Circle 444 on Inquiry Form, page 119, for more data

CYLINDER BLOCKS—Milling bearing faces. Production about 100 per hour. Motch & Merryweather Four-Station Transfer-Type Milling machine.

Circle 445 on Inquiry Form, page 119, for more data

CYLINDER BLOCKS—Milling bearing faces and notch. Production about 100 per hour. Motch & Merryweather Five-Station Transfer-Type Milling machine.

Circle 446 on Inquiry Form, page 119, for more data

CONNECTING RODS—Sawing off cap. Production about 150 per hour. Motch & Merryweather Special No. 00 Saw with two opposed saw heads.

Circle 447 on Inquiry Form, page 119, for more data

CONNECTING RODS—Sawing off cap. Production about 480 per hour. Motch & Merryweather Special Duplex Index Table Type machine with two No. 0 saw heads.

Circle 448 on Inquiry Form, page 119, for more data

PISTONS — Milling for weight standardization. Production about 600 per hour. Motch & Merryweather Automatic Horizontal Single-Spindle Milling machine.

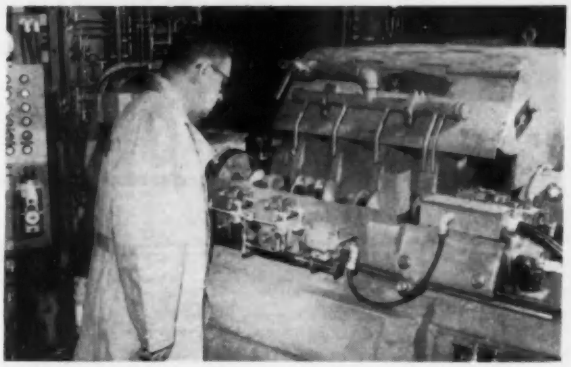
Circle 449 on Inquiry Form, page 119, for more data

PISTONS — Turning diameter, cutting ring grooves, chamfering ring grooves. Production about 600 per hour. Motch & Merryweather Two-Spindle Semi-Automatic Precision Turning machine.

Circle 450 on Inquiry Form, page 119, for more data

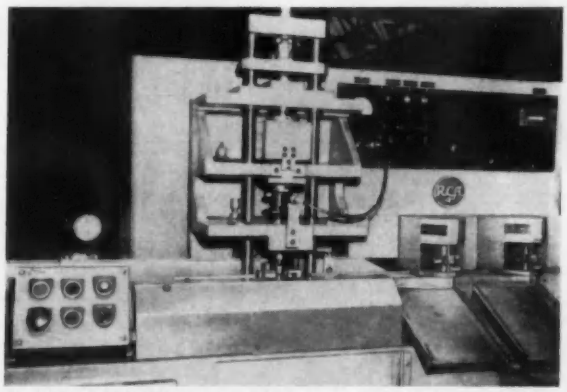
ROCKER ARM SHAFTS—Cutting off to length. Production about 1400 per hour. Motch & Merryweather No. 2-G Machine with automatic loader and bar feed, six bars.

Circle 456 on Inquiry Form, page 119, for more data



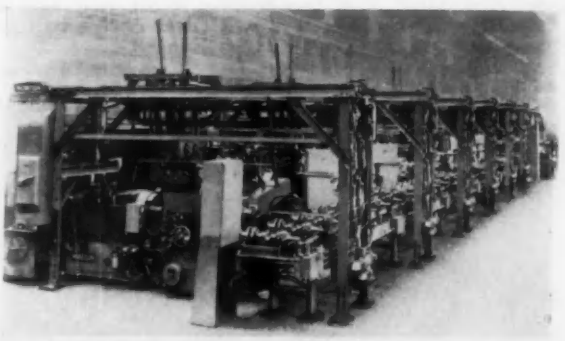
CRANKSHAFTS—Grinding main bearings. Added efficiency 10 per cent over CM multi-wheel grinder. New model machine has greater rigidity and better sizing consistency. Norton CM-2 Semi-Automatic Multi-Wheel grinder.

Circle 453 on Inquiry Form, page 119, for more data



VALVE TAPPETS—Automatic hardness testing, sorting, and counting acceptable and "out-of-limit" parts (Eaton). Output over 2000 per hour per machine, compared to 625 per hour with previous equipment. Tappets range from ⅜ to 1½-in. diam, and are both barrel and mushroom shapes, mechanical and hydraulic types. Most common limits are R_c 55 min, R_c 60 max. Rough machined parts are bulk-loaded directly from heat-treating furnaces into floor hoppers that feed parts to three testing machines. RCA Automatic High-Speed Hardness Testers.

Circle 454 on Inquiry Form, page 119, for more data

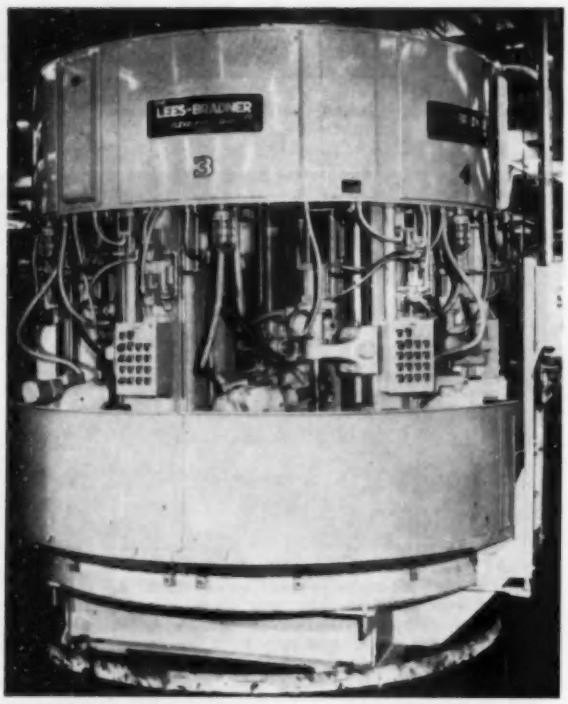


CRANKSHAFTS—Grinding crankpins. Added efficiency 15 per cent over Transfer Pin grinder. Machine made up of several stations, each of which grinds a single crank throw. Parts are automatically fed to and from the machine, automatically ground to size, and automatically deposited in-process on conveyor where parts are rechecked for size, straightness, etc. Norton #2 Unitized Transfer Type Crankpin Grinding machine.

Circle 455 on Inquiry Form, page 119, for more data

Making POWER TRAIN Production PAY

Clutch parts, transmission stators, valve bodies, housings, gears and shafts, universal joints, rear axles, etc.



TRANSMISSION GEARS—Hobbing of teeth. Added efficiency 328 per cent. Machine has six stations mounted on a rotary table. Each station has a completely independent drive and control. Thus, six different parts, or six of the same part, can be handled simultaneously. The new "six-in-one-machine" is a Lees-Bradner Model 7HD 8x20-in. High-Speed Six-Spindle Rotary, Vertical Production Hobbing machine.

Circle 476 on Inquiry Form, page 119, for more data

TRANSMISSION CASES—Boring, facing, chamfering, milling, tapping, and trepanning. Production 125 parts per hour. Ex-Cell-O 24-station Transfer machine.

Circle 477 on Inquiry Form, page 119, for more data

DRIVE SHAFTS—Hobbing splines at ends. New method and application—built for American Motors Corp. Barber-Colman No. 16-16 Multicycle Hobbing machine with special cam.

Circle 462 on Inquiry Form, page 119, for more data

TRANSMISSION GEARS, HEAVY TRUCK—Hobbing of teeth. Added efficiency 100 per cent over conventional No. 14-15 machine. Barber-Colman No. 14-15 Dual Feed Hobbing machine. Hobs two 6 DP, 41-tooth 1½-in. face helical gears in 3 min., 50 sec.

Circle 463 on Inquiry Form, page 119, for more data

PLANETARY PINIONS, AUTOMATIC TRANSMISSION—Hobbing of teeth. New application—built for Buick Motor Div., GMC. Barber-Colman No. 3-6 Automatic Vertical Hobbing machine with automatic loading.

Circle 464 on Inquiry Form, page 119, for more data

PLANETARY SPLINES, TRANSMISSION—Hobbing. Over 100 per cent increase in production. Barber-Colman Automated No. 6-10 Hobbing machine.

Circle 465 on Inquiry Form, page 119, for more data

AXLE SHAFTS—Drilling, reaming, and chamfering. Output increased about five times—from 41 per hour, to 200 per hour, at 80 per cent machine efficiency. BarnesdriL Eight-Station Double-End Trunnion machine. By using horizontal type machine, achieved more effective chip disposal. Preset tooling has made practical the setting up of an effective maintenance program, and thus full benefits from higher speeds and feeds.

Circle 466 on Inquiry Form, page 119, for more data

TRANSMISSION REVERSE CONES — Grinding flat to 0.001 in., with a 25 microinch finish. Output 360 cones per hour. Blanchard Two-Spindle Automatic Surface grinder. Each station of machine can handle two sizes of parts.

Circle 467 on Inquiry Form, page 119, for more data

TRANSMISSION GEARS—Grinding end surface 90-deg to bore. Output 940 gears per hour. Blanchard Two-Spindle Automatic Surface grinder. Automatic unloading.

Circle 468 on Inquiry Form, page 119, for more data

AUTOMOTIVE HYPOID REAR AXLE DRIVES

Productivity of New Gleason Machine Tools
1961 Models vs. 1951 Models

Productivity Increase 67 Per Cent in One Decade, with Balanced Units of Machines Indicated Below
Basis: Automotive axle drive with 4.5 D.P., 11x39 Main Drive; and 5 D.P., 10x16 Differential

Type of Gears	Operation	1961 Models			1951 Models			Productivity Increase
		Machines	Method	Production per Machine per Hour	Machines	Method	Production per Machine per Hour	
Main Drive	Cut Gear Teeth	#112 Rougher #112 Finisher	FORMATE HELIXFORM (R)	21 21	#11 Rougher #11 Finisher	FORMATE SINGLE CYCLE	14.5 14.5	45% 45%
	Cut Pinion Teeth	#116 Rougher #116 Finisher	Ratio Control Fixed Setting	16 16/side	#16 Rougher #16 Finisher	Fixed Setting	9.7 8.5/side	65% 88%
	Die Quench	#529 Quenching Machine	Automatic Loading	180	#16 Quenching Machine	Automatic Loading	51.5	250%
	Lap	#503 Lapper		14.6 pairs	#17 Lapper		8.5 pairs	70%
Differential	Cut Gear Teeth	#109 REVACYCLE	Automatic Loading	81	#8 REVACYCLE	Automatic Loading	67	21%
	Cut Pinion Teeth	#109 REVACYCLE	Automatic Loading	125	#8 REVACYCLE	Automatic Loading	95	32%

Notes: 1. Figures based on 100 per cent operating efficiency.
2. Cutting figures based on a free-machining steel of 160-190 Brinell, i.e. SAE 4028.
3. The production advantages of Gleason HARDAC (R) cutters have been included where applicable.

Circle 478 on Inquiry Form, page 119, for more data

PLANET PINION CARRIERS, TRANSMISSION —Semi-finish and finish boring. Production 90 parts per hour. Aluminum parts are machined two at a time. Tolerance of hole diameter is held to within 0.0005 in. Two different types of carriers are machined in batches, with negligible changeover time. Ex-Cell-O Model 731 Single-end Precision Boring machine. Bulletin 316018.

Circle 469 on Inquiry Form, page 119, for more data

CLUTCH HOUSINGS, TRUCK—Boring and facing. Rough and finish operations completed in a single machine cycle. Ex-Cell-O Model 731 Single-end Precision Boring machine. Bulletin 316018.

Circle 470 on Inquiry Form, page 119, for more data

DIFFERENTIAL CASES—Boring and chamfering. Parts produced at a considerably higher rate than was possible with previous methods. Ex-Cell-O Two-way Precision Boring machine. Bulletin 312081.

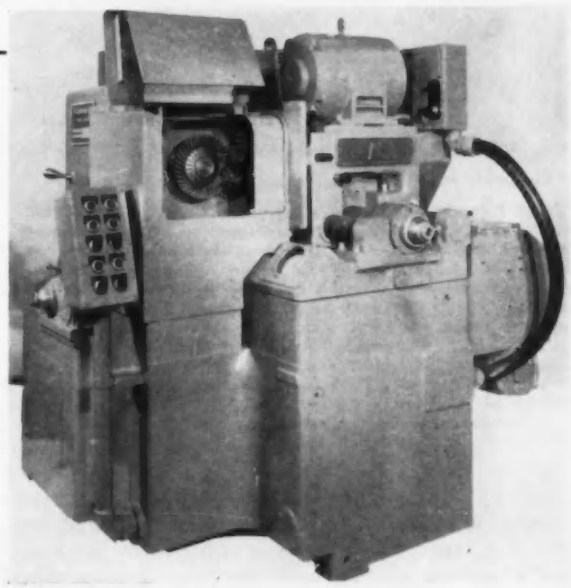
Circle 471 on Inquiry Form, page 119, for more data

DIFFERENTIAL CARRIERS—Finish boring and facing. Gross production 42 parts per hour. Multiple boring and facing performed in one machine cycle. Four slides converge on workpiece simultaneously. Ex-Cell-O Custom Horizontal Precision Boring machine. Bulletins 505911 and 312081.

Circle 472 on Inquiry Form, page 119, for more data

UNIVERSAL JOINT SLEEVE YOKES—Grooving and counterboring. Parts produced at the rate of 385 per hour. Both ends of part machined simultaneously. Machine uses special circular form tool with novel method of feeding the tool. Ex-Cell-O Custom Horizontal Precision Boring machine (two-way, four spindles). Bulletins 505911 and 312081.

Circle 473 on Inquiry Form, page 119, for more data



AXLE GEARS—Lapping of teeth. Added productivity 70 per cent over No. 17 lapper. Superior quality. New machine designed primarily for lapping automotive spiral bevel and hypoid gears and pinions operating at 90-deg shaft angle. Gleason No. 503A Hypoid Lapper. (Also see table at top of this page.)

Circle 479 on Inquiry Form, page 119, for more data

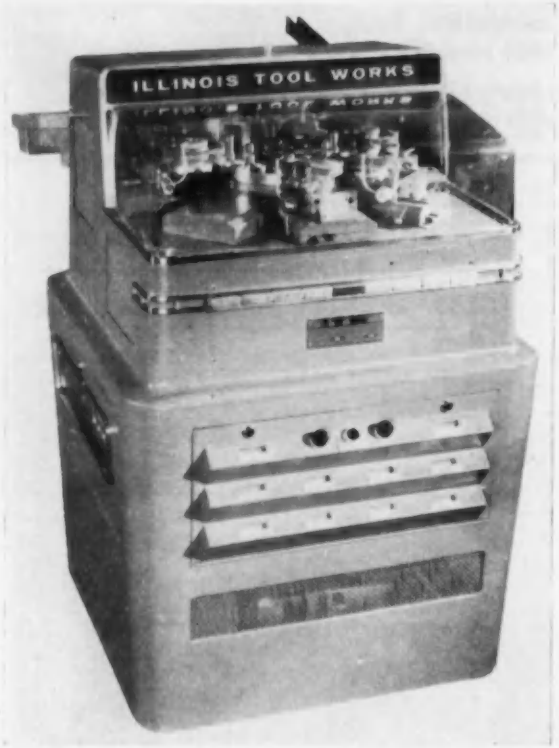
CLUTCH THROW-OUT LEVERS—Drilling and tapping. Added efficiency 20 to 30 per cent over single-spindle machine. Bodine 42-30 Dial Type machine.

Circle 474 on Inquiry Form, page 119, for more data

TORQUE CONVERTER STATORS, TRANSMISSION—Finish boring, finish turning, facing, skiving, grooving, and chamfering. Production exceeds 140 parts per hour. Both sides of stator machined in same cycle. Ex-Cell-O Model 752 Double-end Precision Boring machine. Bulletin 316019.

Circle 475 on Inquiry Form, page 119, for more data

Making POWER TRAIN Production *PAY*



TRANSMISSION GEARS, PINIONS AND CLUSTERS—Automatic, 100 per cent inspection. Improves quality level at reduced cost. Machine indicates deviations from desired tolerances. Offending production process can be immediately corrected, minimizing quantity of scrap parts. All important elements can be segregated, such as runout, tooth to tooth, nick, P.D. size, lead, angular velocity, bore size, taper, and squareness. Accounting mechanism is available to show the actual number of gears being approved or rejected. Illinois 2800 Series Rotary Automatic Gear inspection machine.

Circle 497 on Inquiry Form, page 119, for more data

UNIVERSAL JOINT BALL AND BUSHING ASSEMBLIES—Finish boring, counterboring, and facing. Net production is 148 pieces per hour. Locating and chucking arrangement designed for handling awkward part configuration. Two-speed motors permit boring at one speed, facing at a slower speed. Ex-Cell-O Model 752 Double-end Precision Boring machine. Bulletin 316019.

Circle 480 on Inquiry Form, page 119, for more data

PLANET CARRIER PINION GEARS, TRANSMISSION—Boring of inside diameter. Production is nearly 400 parts per hour. Accuracy of bore size held to within 0.0006 in.; bore held square to face of part within 0.0003 in. Ex-Cell-O Model 751 Single-end Precision Boring machine, automated. Bulletin 316019.

Circle 481 on Inquiry Form, page 119, for more data

TRANSMISSION OUTPUT SHAFTS—Finish boring, facing, and chamfering. Gross production 136 pieces per hour. Two parts are machined at a time. Ex-Cell-O Model 751 Single-end Precision Boring machine. Bulletin 316019.

Circle 482 on Inquiry Form, page 119, for more data

REAR AXLE SHAFTS, TRACTOR—Semi-finish boring, finish boring, and chamfering. Gross production 37 pieces per hour. Ex-Cell-O Model 751 Single-end Precision Boring machine. Bulletin 316019.

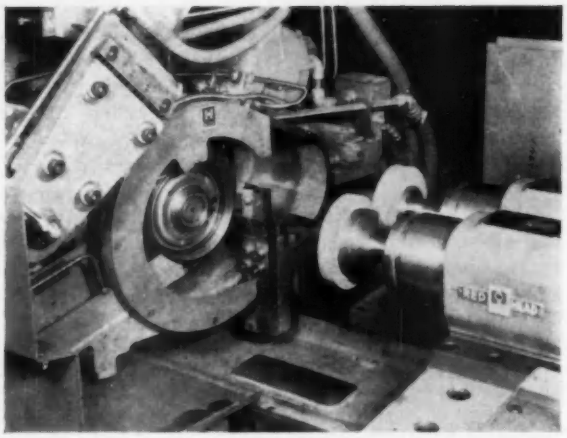
Circle 483 on Inquiry Form, page 119, for more data

PROPELLER SHAFT PINION FLANGES—Facing and chamfering with milling cutters. Net production 188 parts per hour—about twice that formerly obtained with other methods. Ex-Cell-O Model 752 Double-end Precision Boring machine. Bulletin 316019.

Circle 484 on Inquiry Form, page 119, for more data

FINAL DRIVE COVERS, OFF-THE-HIGHWAY EQUIPMENT—Boring, turning, facing, and chamfering. Machine is versatile. It is capable of finish boring to close limits, or it may be set up to perform both rough and finishing operations in one machine cycle. Ex-Cell-O Model 772 Double-end Precision Boring machine. Bulletin 315814.

Circle 485 on Inquiry Form, page 119, for more data



REVERSE CONES, AUTOMATIC TRANSMISSION—Grinding of ID and OD surfaces simultaneously. Production 53 pieces per hour at 80 per cent efficiency. Material is steel; stock removal 0.015 in.; and finish 25 microinches rms. Heald two-spindle Model 271 Size-Matic grinder, with automatic loading and unloading.

Circle 498 on Inquiry Form, page 119, for more data

HYDRAULIC VALVE BODIES—Deburring, cleaning, and buffing. Cycle time 10 to 12 minutes, capacity 200 to 1000 pieces per hour depending upon size. Drum of machine is 72 in. diam, 84 in. long. FENN-O-MATIC.

Circle 486 on Inquiry Form, page 119, for more data

PUMP COVERS—Grinding. Production 250 pieces per hour at 100 per cent efficiency. Gardner Model 2H40, 42 in. Rotary Carrier Double Disk grinder. Catalog D-60.

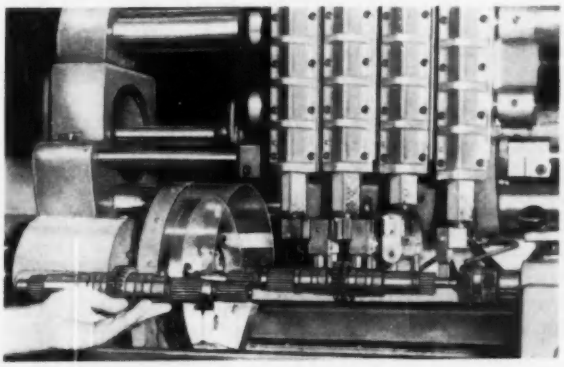
Circle 487 on Inquiry Form, page 119, for more data

DIFFERENTIAL BEARING ADJUSTING NUTS—Turning, chamfering, threading, and facing, with one chucking (Mack Truck). Floor-to-floor time 106 seconds per piece—reduced 50 to 60 per cent. Setup handles more than 10 different cast-iron adjusting nuts. Tooling includes an automatic turning slide, a front threading slide, and an automatic facing slide. Gisholt CRI-DAN Threading lathe.

Circle 488 on Inquiry Form, page 119, for more data

CLUTCH PRESSURE PLATES—Rough and finish facing; rough and finish boring and chamfering of ID, one chucking (Long Mfg.). Floor-to-floor time 3.02 minutes—30 per cent less. Finish on clutch face 120 to 160 microinches rms. Four sizes of cast-iron parts. Gisholt Simplimatic Automatic Chucking lathe, with three separate tool slides.

Circle 489 on Inquiry Form, page 119, for more data



TRACTOR TRANSMISSION INPUT SHAFTS—Finishing bearing and seal diameters. Production 48 parts per hour. Six stones working together automatically finish six surfaces to 8 microinches rms. Gisholt Model 51 General-Purpose Superfinisher.

Circle 499 on Inquiry Form, page 119, for more data

UNIVERSAL JOINT SPIDERS—Grinding. Production 2400 pieces per hour at 100 per cent efficiency. Grinding four trunnion ends. Parts are automatically loaded, indexed, and unloaded. Gardner Model 2H30, 30 in. Rotary Carrier Double Disk grinder. Catalog D-60.

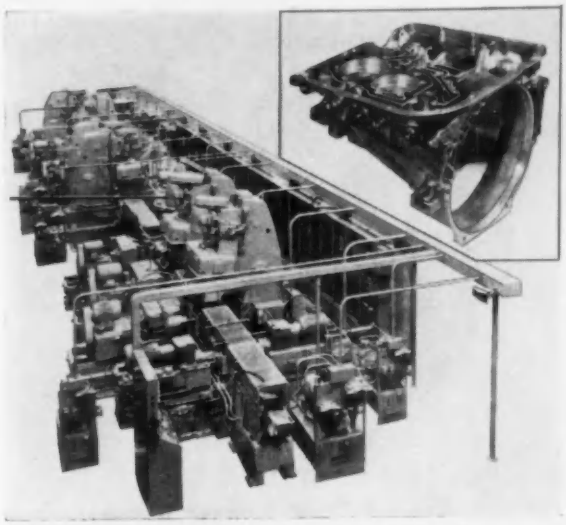
Circle 490 on Inquiry Form, page 119, for more data

CLUTCH PLATES—Rough grinding, removing 0.046 in. of stock. Production 1800 pieces per hour at 100 per cent efficiency. Gardner Model 2H30, 30 in. Feed-Thru Double Disk grinder. Catalog D-60.

Circle 491 on Inquiry Form, page 119, for more data

PLANET CARRIERS, AUTOMATIC TRANSMISSION—Drilling and reaming. Production 257 pieces per hour at 100 per cent efficiency. Material is malleable iron; tolerance is 0.0008 in. on diameter. Heald Vertical Column, Dial Type Model S Bore-Matic.

Circle 492 on Inquiry Form, page 119, for more data



TRANSMISSION CASES — Drilling, boring, chamfering, countersinking, and reaming. Production 180 pieces per hour at 100 per cent efficiency; 126 pieces per hour at 80 per cent efficiency. Workpiece is of die-cast aluminum. Greenlee 55-station Automatic Transfer machine.

Circle 500 on Inquiry Form, page 119, for more data

DIFFERENTIAL CARRIERS—Rough and finish facing of flange; turning and chamfering of register diameter; and machining of four half-bearing faces on one (of two) machines (IHC). Time 5 minutes f-t-f compared to 9.68 minutes by prior method. On second machine, after cap assembly added, register diameter is finished, and four radii on bearing cap ears are rough and finish turned, and chamfered. Time 4.4 minutes f-t-f compared to 7.59 minutes by prior method. Gisholt MASTERLINE Simplimatic Automatic Chucking Lathes, each with three tool slides.

Circle 493 on Inquiry Form, page 119, for more data

TRANSMISSION CASES—Drilling, boring, chamfering, probing, reaming, and tapping. Production 181 pieces per hour at 100 per cent efficiency; 127 pieces per hour at 70 per cent efficiency. Workpiece is of die-cast aluminum. Greenlee 48-station Automatic Transfer machine.

Circle 494 on Inquiry Form, page 119, for more data

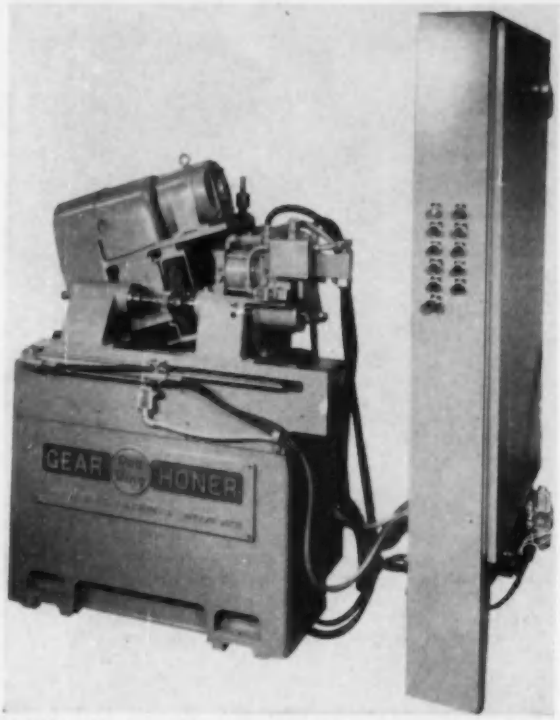
TRANSMISSION CASES — Drilling, chamfering, countersinking, reaming, and tapping. Production 183 pieces per hour at 100 per cent efficiency; 128 pieces per hour at 70 per cent efficiency. Workpiece is of die-cast aluminum. Greenlee 49-station Automatic Transfer machine.

Circle 495 on Inquiry Form, page 119, for more data

TRANSMISSION CASES—Drilling, boring, chamfering, facing, probing, and tapping. Production 182 pieces per hour at 100 per cent efficiency; 127 pieces per hour at 70 per cent efficiency. Workpiece is of die-cast aluminum. Greenlee 40-station Automatic Transfer machine.

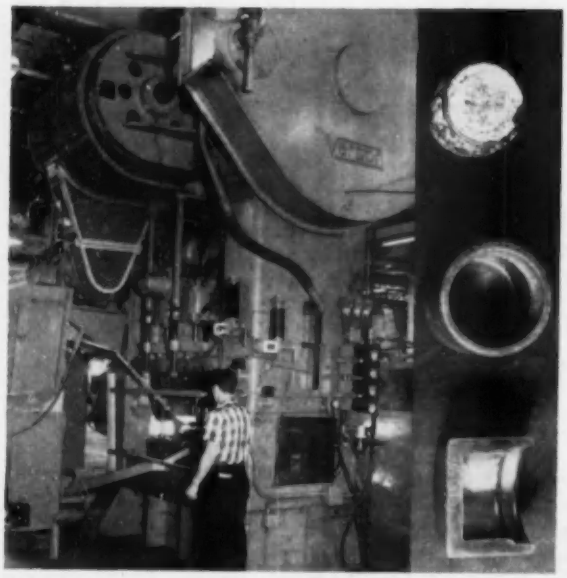
Circle 496 on Inquiry Form, page 119, for more data

Making POWER TRAIN Production *PAY*



GEARS—Honing of hard gear teeth. Saving over manual correction 67 per cent. New machine is more versatile and compact than previous machine; offers four methods of honing. National Broach Red Ring Model GHD Hard Gear Tooth Honer.

Circle 516 on Inquiry Form, page 119, for more data



UNIVERSAL JOINT BEARING RACES—Impact machining (extruding). Production 70 pieces per minute; 4200 per hour. Operations performed are process shear and head, anneal, zinc phosphate lubricate, and extrude in two blows. Material SAE 1112 modified steel, in hot-rolled condition, coil form. Metal savings over other processes about 56 per cent. Due to extruding process minimizing thermal distortion during later hardening, grinding stock reduced about 70 per cent, saving material as well as grinding cost. Verson Model EC-2-500-60-48T Impact Machining Press with dial-type tools and automated feeding equipment.

Circle 517 on Inquiry Form, page 119, for more data

UNIVERSAL JOINTS—Precision form-grinding of yokes. Machine features higher precision. Detroit Gear Grinder. Bulletin DGG.

Circle 501 on Inquiry Form, page 119, for more data

AXLE HOUSINGS—Arc-welding differential cover and end flanges to housing. Added efficiency 60 per cent faster than prior method. Lincoln Electric Co. Fully-Automatic INNERSHIELD Process Welder, employing a tubular electrode containing filler metal, arc shielding, deoxidizers, and fluxes.

Circle 502 on Inquiry Form, page 119, for more data

TORQUE CONVERTER HOUSINGS—Facing both ends by grinding. Production rate 17.4 pieces per hour. Stock removal 0.060 to 0.070 in. from each side, holding surfaces flat and parallel within 0.0015 in. Parts are gray-iron castings. They were formerly milled (two cuts per surface) and then finish ground. Mattison Duplex Rotary Surface Grinder. Bulletin 145.

Circle 503 on Inquiry Form, page 119, for more data

UNIVERSAL JOINT SPIDERS — Grinding four ends. Parts measure 7¾ in. over ground surfaces. Stock removal 0.010 in. Opposite ends of spiders must be ground-to-size, square with trunnion diameter and parallel with each other. Parts are held in V-fixtures with swiveling U-blocks, and fed through machine on a rotary-drum-type feed mechanism. Mattison No. 221 Double-Spindle Disk Grinder. Bulletin 647-1.

Circle 504 on Inquiry Form, page 119, for more data

FLANGE AND BUSHING ASSEMBLIES, CONVERTER REACTION SHAFTS—Finishing of interrupted pump face surfaces (Buick). Cup-shaped stone removes up to 0.001 in. of stock in 32-second automatic cycle. Finish 8 microinches rms; flatness within 0.0002 in. Gisholt Model 81 Single-Spindle Vertical Superfinisher.

Circle 518 on Inquiry Form, page 119, for more data

CLUTCH PARTS—Thread rolling. Using only one set of thread rolls, a direct cost of 16½¢ per thousand was realized in rolling 250,000 pieces. Work is ½ in., 13-pitch, UN, Class 2A, ⅝ in. long threads on B1113 bar stock. Attachment is mounted on a Six Spindle Conomatic. Landis Machine Co. 18GA LAN-ROLL Thread Rolling attachment.

Circle 505 on Inquiry Form, page 119, for more data

DIFFERENTIAL SIDE GEARS — Grinding OD and face. Added efficiency 40 per cent over Type CH machine. Cycle is completely automatic. Landis Tool Co. Type R Chucking Grinding machine.

Circle 506 on Inquiry Form, page 119, for more data

VALVE BODIES, AUTOMATIC TRANSMISSION —Drilling, tapping, reaming, and gun drilling. Added efficiency 10 per cent. Heald Model S Multi-Unit, Transfer-type Bore-Matics.

Circle 507 on Inquiry Form, page 119, for more data

OIL PUMP BODIES, AUTOMATIC TRANSMISSION—Turning and facing pump pockets. Added efficiency 50 per cent. Heald Model 221 Bore-Matic boring machine.

Circle 508 on Inquiry Form, page 119, for more data

TORQUE CONVERTER HOUSINGS — Finish grinding of two faces. Production up to 40 parts per hour. Parts of aluminum. Parallelism and flatness held to 0.003 in. on both surfaces. Duplex table permits operator to set up one work table while second table is under wheel. Mattison Duplex Rotary Surface Grinder. Bulletin 145-4RM.

Circle 509 on Inquiry Form, page 119, for more data

SHAFTS, AXLE AND TRANSMISSION—Rolling of splines, serrations, grooves, threads, and similar forms. Up to 30 times faster than hobbing. Michigan 3000 Series Roto-Flo machine. Bulletin RF-60.

Circle 510 on Inquiry Form, page 119, for more data

CROWN GEARS, HELICOPTER TYPE—Grinding. Permits new design. Grinds accurate fully-crowned, spherical gears. Detroit Gear Grinder. Bulletin DGG.

Circle 511 on Inquiry Form, page 119, for more data

CLUTCH PIVOT RELEASE LEVERS — Milling. Added efficiency 20 per cent over turning and grinding. Quality also improved. Part is a truncated sphere. Micromatic Model 5VMB Milling machine.

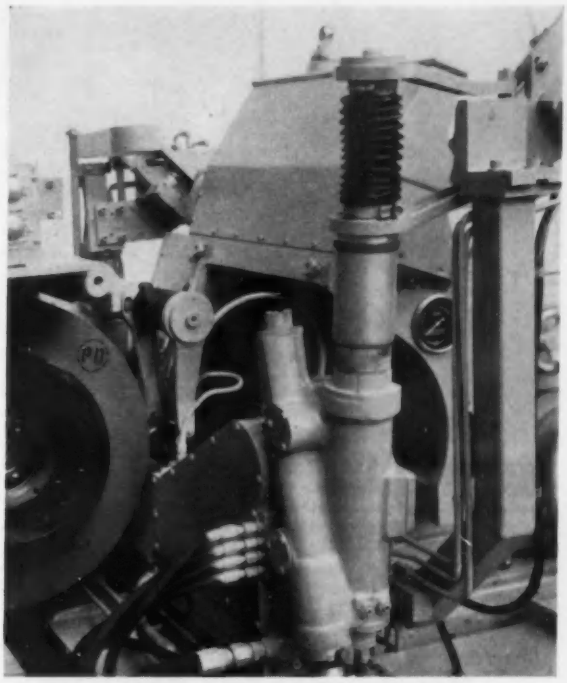
Circle 512 on Inquiry Form, page 119, for more data

BEARINGS—Microhoning ball tracks. Added efficiency 30 per cent over rope polishing. Improved quality. Machines can be arranged with one to five spindles. Micromatic Microhoners, Models 2HRI (inner rings) and 2HRO (outer rings).

Circle 513 on Inquiry Form, page 119, for more data

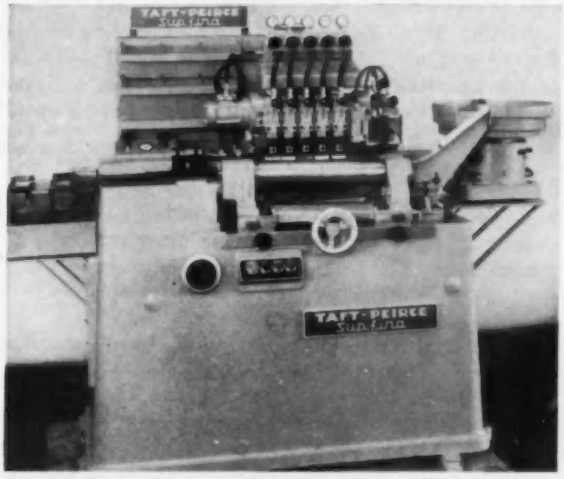
CLUTCH HOUSINGS—Forming. New application. Cincinnati H-200 Intraform Metal-Forming machine.

Circle 514 on Inquiry Form, page 119, for more data



UNIVERSAL JOINT SPIDERS—Grinding bearing diameters and oil seal radii. Production 435 per 60-minute hour. Cycle time 30 per cent faster than prior method; plus saving in wheel-truing time now done while work being unloaded and loaded. Stock removal 0.021 in.; finish 30 microinches. Roundness within 0.0002 in. Machine cycle, infeed with wheel compensation, wheel-truing, loading and unloading are all automatic. Two machines used in tandem, with fast indexing between machines. Cincinnati No. 220-8 Centuramic Centerless Grinding machines.

Circle 520 on Inquiry Form, page 119, for more data



PLANETARY GEAR SHAFTS — Centerless microstoning. Approximate efficiency gain over prior practice 800 per cent. Estimated reduction in total manufacturing cost 20 per cent. The single machine replaced four machines in production sequence of obtaining finish and roundness. Taft-Peirce Supfina No. 88 Through-Feed Centerless Microstoner.

Circle 519 on Inquiry Form, page 119, for more data

TRANSMISSION HOUSINGS—Milling and drilling. New application. Cincinnati Special Multi-Station Transfer Line.

Circle 515 on Inquiry Form, page 119, for more data

Making POWER TRAIN Production *PAY*

AUTOMATIC TRANSMISSION PARTS (e.g. Oil Pump Housings, Clutch Retainer Assemblies, etc.)—Deburring. Two airless-blast mechanical deburring machines replaced 12 air-blast cabinets previously required for operation. Wheelabrator Spinner Hanger Cabinets.

Circle 538 on Inquiry Form, page 119, for more data

DIFFERENTIAL SIDE GEARS—Grinding bearing diameter and shoulder simultaneously. New application. Cincinnati No. 1 Chucking grinder.

Circle 521 on Inquiry Form, page 119, for more data

TRANSMISSION PINION GEARS—Microhoning ID. Added efficiency 20 per cent over Model 738 single-spindle machine. Horizontal stacking increases production, reduces cost. Micromatic Model 150 Hydrohoner.

Circle 522 on Inquiry Form, page 119, for more data

BEVEL DRIVE PINIONS, TRACTOR—Rough and finish turning. Total cycle time, including handling, is 1.14 minutes per piece. Workpiece is an SAE 8620 forging. Carbide cutting tools are used. Monarch Model 21-H Mano-Matic Lathe.

Circle 523 on Inquiry Form, page 119, for more data

CLUSTER GEARS—Turning, boring, and reaming. Added efficiency 5 per cent over prior practice. National Acme Co. 8-in. RPA-6 machine.

Circle 524 on Inquiry Form, page 119, for more data

BEVEL GEARS—Turning radius, burnishing face and ID. Added efficiency 8 per cent over prior practice. National Acme 6-in. RPA-8 machine.

Circle 525 on Inquiry Form, page 119, for more data

GEARS—Shaving of teeth. Saving 20 per cent over previous method. Complete freedom for overhead loading of heavy work units. National Broach Red Ring Rotary Gear Shaving machine, Model GCX-24 in.

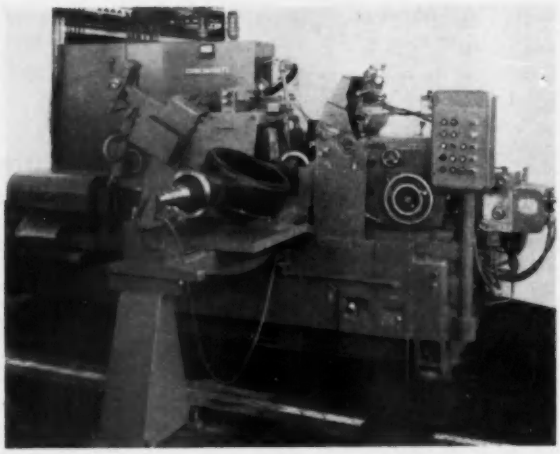
Circle 526 on Inquiry Form, page 119, for more data

GEARS—Shaving of teeth. Twenty per cent faster than older machine. Automatic loading increases productive machine time 50 per cent. National Broach Red Ring Universal Diagonal Gear Shaving machine, Model GCU.

Circle 527 on Inquiry Form, page 119, for more data

INPUT AND OUTPUT SHAFTS—Grinding of line diameters. Added efficiency up to 200 per cent if conventional cylindrical grinders have been used. Recommended machine combines cuts previously requiring several machines, grinds all simultaneously in one plunge grind, and does so in about the same time as individual machines previously used. Norton Type CM Semi-Automatic Multi-Wheel grinder.

Circle 528 on Inquiry Form, page 119, for more data



REAR AXLE HOUSINGS, TRUCK—Grinding three bearing diameters and one seal diameter simultaneously, plus a clean-up grind on shoulder and a blending radius, on both ends of housing. Production 30 ends per 50-minute hour. Stock removal 0.015 in. on diam. Finish 30 microinches. Roundness within 0.0008 in. Customer's machines were fitted into an automated line, using four machines for one end of workpiece and four machines for the other end, in two separate lines. Automatic gaging, sizing, and wheel-truing. Cincinnati 325-12 Centuramic Centerless grinders.

Circle 539 on Inquiry Form, page 119, for more data

STATOR SUPPORTS—Grinding for bearings and diameters. Added efficiency 20 per cent over 10-in. angular wheelslide grinder. Wheel speed of 8500 sfpm plus reprocessing manufacture offer increased production and efficiency. Norton 10-in. Type CTU Semi-Automatic Cylindrical Grinding machine.

Circle 529 on Inquiry Form, page 119, for more data

STATOR SUPPORTS—Grinding of thrust wall. Added efficiency 20 per cent over 10-in. angular wheelside grinder. Two machine models. Wheel speed of 8500 sfpm plus reprocessing manufacture offer increased production and efficiency. Norton 10-in. Type CV-4 Angular Wheelslide Grinding machine, and Norton Type CP-1 PLUNGE-O-MATIC Grinding machine.

Circle 530 on Inquiry Form, page 119, for more data

TRANSMISSION SHAFTS—Grinding of line diameters. Added efficiency up to 150 per cent over 10-in. semi-automatic cylindrical grinder. By combining operations, newer model reduces number of machines required. Norton 10-in. Type CTU-HD Semi-Automatic Cylindrical Grinding machine with multiple wheels.

Circle 531 on Inquiry Form, page 119, for more data

TRANSMISSION SPUR GEARS — Cutting all teeth simultaneously. Output 10 to 16 times that of conventional gear shapers. Michigan Shear-Speed Gear Shaper. Bulletin SS-55.

Circle 532 on Inquiry Form, page 119, for more data

SPLINED SLIP YOKES—Forging. Production 750 pieces per hour. National Machinery 4-in. Automatic Tong-Feed Forging machine.

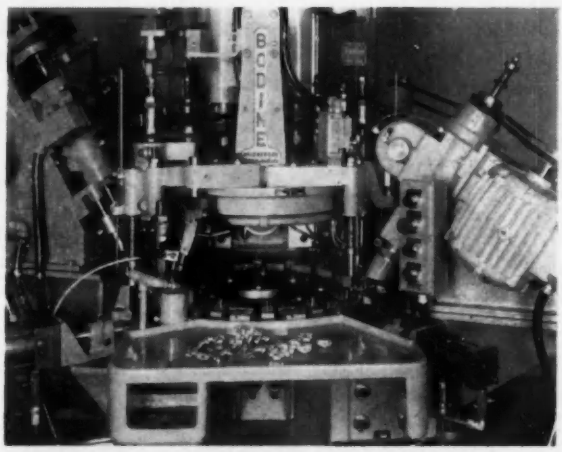
Circle 533 on Inquiry Form, page 119, for more data

DIFFERENTIAL SIDE GEARS—Forging blanks. Production 600 per hour. National Machinery 3-in. Single-Blow Forging machine.

Circle 534 on Inquiry Form, page 119, for more data

GEARSHIFT LEVERS (Valiant and Lancer)—Forming by bending. Bends are more accurate than those previously produced, and are free of scratches or mars, thus eliminating secondary polishing operation and lowering scrap rate. Part is now produced on machine with one set of bending dies stacked on top of the other to enable the same machine to produce two different bend radii, or a completed lever in one operation. Pines Model ¾ Bending machine. Catalog 356.

Circle 535 on Inquiry Form, page 119, for more data



TRANSMISSION VALVE BODIES—Milling, drilling, reaming, tapping, and recessing. (Workpiece is a die-cast thermostat valve body for a small-car automatic transmission oil-cooling unit.) Twelve machining operations are performed; and output is 500 pieces per 50-minute hour. Bodine 48-30 Dial Type Drilling and Tapping machine.

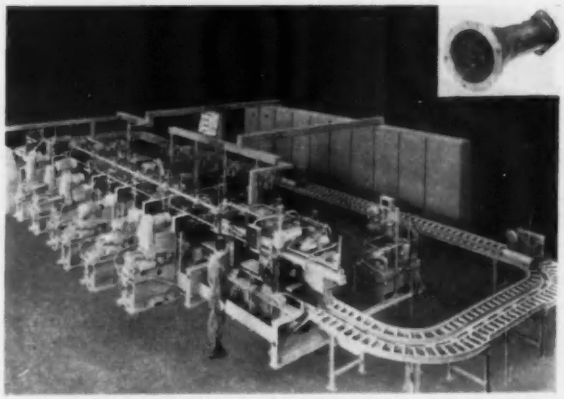
Circle 540 on Inquiry Form, page 119, for more data

TRANSMISSION SHAFTS—Milling to length and centering to depth. Production 180 to 250 per hour. Motch & Merryweather No. 3 MCT Trunnion-Type Milling and Centering machine with automatic loading and unloading.

Circle 536 on Inquiry Form, page 119, for more data

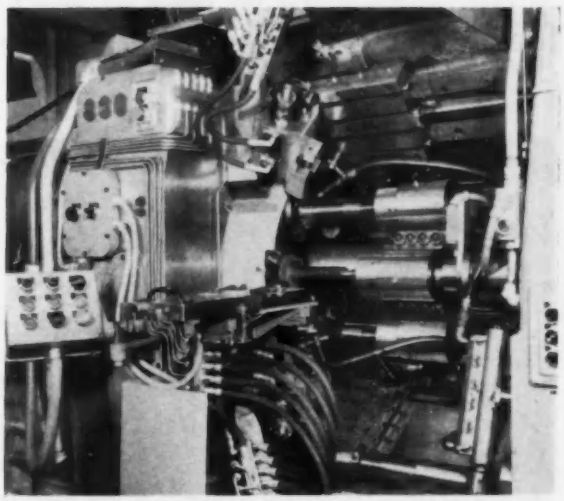
UNIVERSAL JOINT YOKES—Rough-turning OD and facing shoulders. Production about 480 per hour. Motch & Merryweather Four-Spindle Precision Turning machine.

Circle 537 on Inquiry Form, page 119, for more data



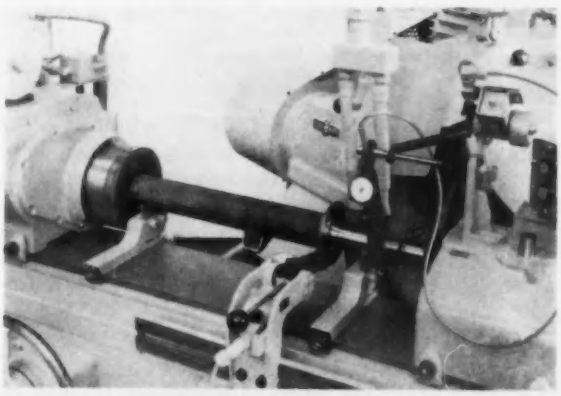
TORQUE TUBE ASSEMBLIES—Boring, chamfering, facing, drilling, reaming, and washing. Sundstrand 9-station 15-head Pallet Type Transfer machine.

Circle 541 on Inquiry Form, page 119, for more data



TRANSMISSION SHAFTS — Turning and facing. Added efficiency 45 per cent over prior practice. National Acme Co. 8-in. RPA-6 Acme-Gridley Universal Shaft machine.

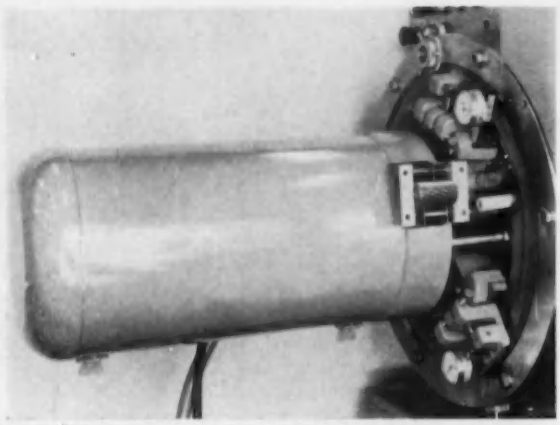
Circle 542 on Inquiry Form, page 119, for more data



REAR AXLE SHAFTS—Grinding two bearing diameters, thrust face and radius, and oil seal diameter. Previously these three operations were done on individual machines requiring 1.8 minutes. In new installation operations have been combined in one machine, which completes job in 0.6 minutes. Closer tolerances also being held. Cincinnati 30 x 48 in. 30-deg Angular Wheelslide Grinding machine.

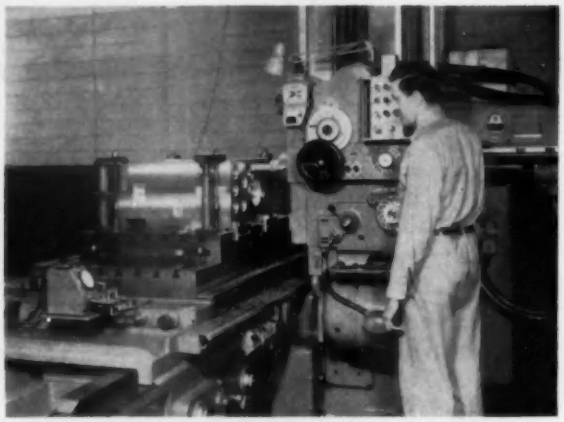
Circle 543 on Inquiry Form, page 119, for more data

Making POWER TRAIN Production *PAY*



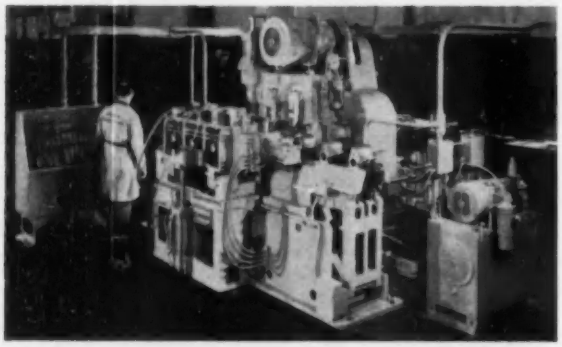
TRANSMISSION PINION GEARS—Roll-finishing (burnishing) of involute teeth. Up to 10 times faster than chip-making methods previously employed. Production rates, using thru-feed principle of rolling, are approximately 20 pieces per minute. From soft hobbed gear teeth of 75 to 90 microinches rms, the involute surface of teeth is improved to 4 to 8 microinches rms. Reed Three Cylindrical Die Involute Rolling machine.

Circle 553 on Inquiry Form, page 119, for more data



GEAR BOXES—Boring and milling, experimental and small-lot production. Added efficiency 40 to 200 per cent over conventional horizontal boring machines and jig borers. DeVlieg SPIRAMATIC JIGMIL equipped with DIATROL Direct Dial Dimensioning System, and with index table which permits boring and milling of parts on several surfaces in one setup.

Circle 554 on Inquiry Form, page 119, for more data



TRANSMISSION CASES—Finish-machining of both ends. To accurately generate mounting faces square with bore, machine picks up parts with arbors that expand in the bore. The spindles which rotate parts are counter-weighted to minimize off-balance effect of the irregularly-shaped housing. Variable tool feed and a variable-speed d-c drive motor maintain uniform cutting rate as tools feed from largest to smallest diameter. Cross Transfer-matic has three stations.

Circle 555 on Inquiry Form, page 119, for more data

TRANSMISSION MAIN SHAFTS—Rolling of helical involute splines. Production rate 4 to 5 pieces per minute. Rolled is a 34-tooth, 20/40 D.P., 30-deg pressure angle involute helical splines. Thru-feed method employed permits precision-rolling of any length of involute spline or serration. Reed Model A-425 Horizontal Three Cylindrical Die Type Involute Rolling machine.

Circle 544 on Inquiry Form, page 119, for more data

TORUS COVER PARTS—Both machining and non-machining operations in one continuous line. Operations performed are boring, turning, facing, chamfering, drilling, honing, deburring, tapping and reaming; as well as welding, heat treating, gaging, testing, assembly, and marking. Sundstrand 43-Station Transfer machine.

Circle 545 on Inquiry Form, page 119, for more data

CLUTCH HOUSINGS—Milling and finish-boring after assembly to cyl. block. Production about 55 per hour. Motch & Merryweather Four-Station Transfer-Type Milling and Boring machine.

Circle 546 on Inquiry Form, page 119, for more data

TORQUE CONVERTER COVER — Turning OD and hub, and facing bosses and hub. Production 90 pieces per hour per spindle at 100 per cent efficiency. Material is steel. Motch & Merryweather Two-Spindle Vertical Turner.

Circle 547 on Inquiry Form, page 119, for more data

UNIVERSAL JOINT YOKES—Tracer turning. Production 176 pieces per hour per spindle at 100 per cent efficiency. Motch & Merryweather Two-Spindle Vertical Turner.

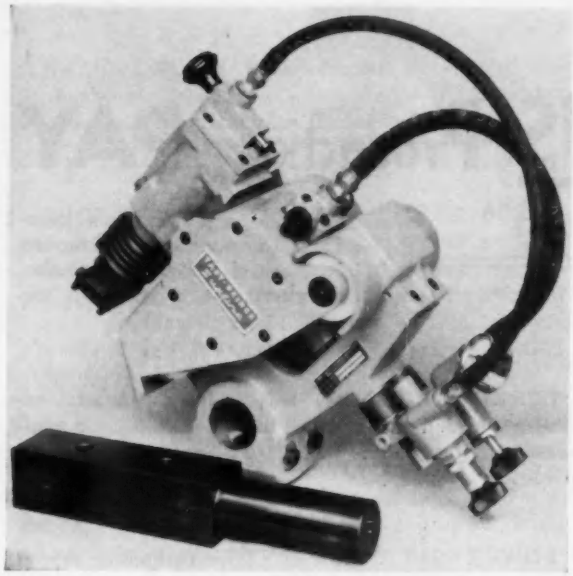
Circle 548 on Inquiry Form, page 119, for more data

CLUTCH HOUSINGS—Multiple machining operations. Housing is rough and finish milled on cylinder block face and gear box face. Two pads are milled, and 27 different holes are drilled, tapped, reamed, counterbored and spot-faced. Starter hole is rough and finished bored. Sundstrand 20-Station Pallet-Type Transfer machine.

Circle 549 on Inquiry Form, page 119, for more data

DIFFERENTIAL RING GEARS—Automatic precision hot-forging with one press unit. Production 18 per minute, 1080 per hour. Material 8620 steel billet bars, hot-forging quality, sheared to size. Workpieces are automatically put through eight die operations, from heating furnace to cooling conveyor, with no material handling or storage. Due to size control, and precision forging and re-striking tools, forgings are consistent and less material has to be removed in machining. Verson Model ES-2-4000-168-60T Transmat Hot Forging Press with transfer feeding unit, and special heating and cooling provisions.

Circle 550 on Inquiry Form, page 119, for more data



CLUTCH PLATES—Microstoning. Approximate gain in efficiency 40 per cent. Two attachments on special turning and boring machine eliminated a secondary grinding operation. Taft-Peirce No. 81 Microstoning Attachments with automatic cycling.

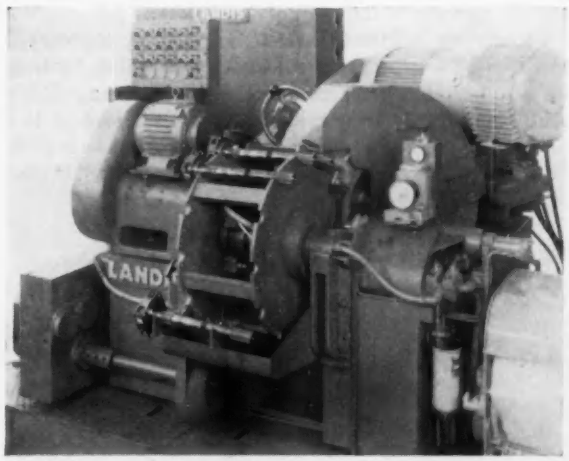
Circle 556 on Inquiry Form, page 119, for more data

TRANSMISSION CASES—Milling, drilling, tapping, and boring. Production about 120 per hour. Motch & Merryweather In-line Transfer machine.

Circle 551 on Inquiry Form, page 119, for more data

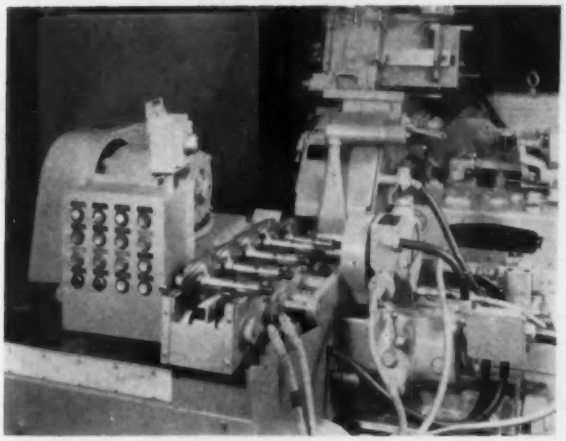
TRANSMISSION GEARS—Shot-peening. Increased strength imparted to gears by shot-peening enabled same-size parts to be retained for greatly-increased torque requirements. Wheelabrator Wheelapeen Cabinet.

Circle 552 on Inquiry Form, page 119, for more data



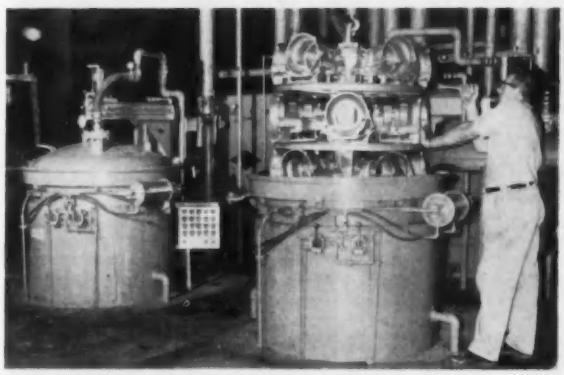
TRANSMISSION SHAFTS—Grinding multiple diameters and flange face. Added efficiency 25 per cent over Type CH machine. Grinding wheelhead is set at a 30-deg. angle, and spaced wheels are mounted on the right-hand end of wheel spindle. Landis Tool Co. Type R Automatic Plunge grinder.

Circle 557 on Inquiry Form, page 119, for more data



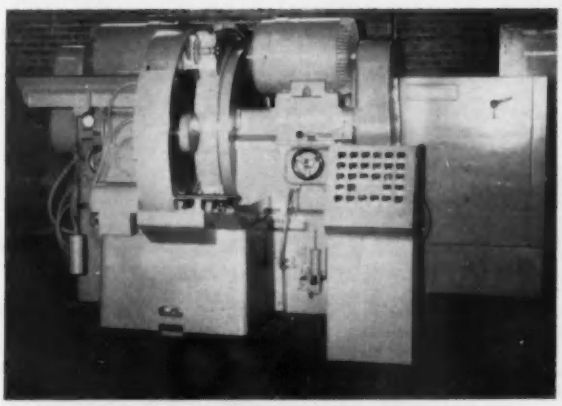
STEM PINIONS—Grinding line diameters. Added efficiency 10 per cent over 10-in. semi-automatic cylindrical grinder, manually-controlled. Higher wheel speed might give added production benefits of up to 20 per cent. Parts are loaded and unloaded automatically. Norton 10-in. Type CTU Semi-Automatic Cylindrical Grinding machine with automatic equipment.

Circle 558 on Inquiry Form, page 119, for more data



TRANSMISSION CASES — Impregnating aluminum castings. Production rate, with dual autoclaves, 1360 castings per 8-hour day at 80 per cent efficiency. System uses Perlox Seal, a metal oxide type sealer. Prenco Products, Inc.

Circle 559 on Inquiry Form, page 119, for more data



SERVO-ACCUMULATOR COVERS — Grinding two unsymmetrical sides simultaneously. Production 250 pieces per hour at 100 per cent efficiency. Material aluminum alloy. Stock removal 0.070 to 0.090 in.; flatness 0.0005 to 0.001 in. Gardner Model 2H40, 42 in. Rotary Carrier Double Disk grinder. Catalog D-60.

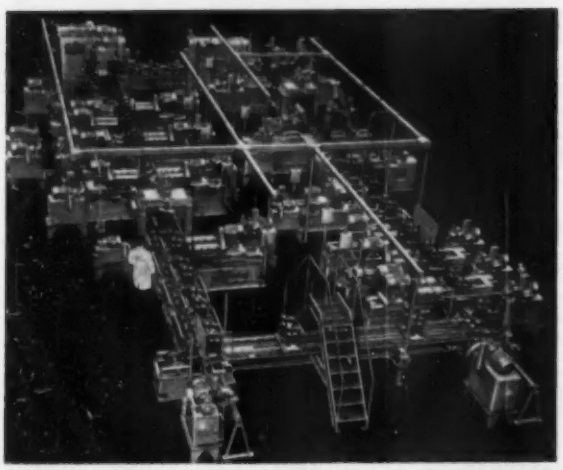
Circle 560 on Inquiry Form, page 119, for more data

Making CHASSIS Production PAY

Brake shoes and wheel cylinders, steering housings, gears, valves, and knuckles, ball joints, wheel hubs and spindles, shock absorbers, tire valve stems, etc.

BALLNUTS, STEERING GEAR—Cutting functioning form. Considerable increase in production due to automated loading. Barber-Colman Special Internal Threading machine, with automatic loading.

Circle 576 on Inquiry Form, page 119, for more data



POWER STEERING GEAR HOUSINGS—Boring, milling, drilling, and assembly of worm thrust bearing cup and pitman shaft bushing. Production output rate is 300 per hour. Castings are located and clamped only once during processing—in pallets that allow access of tools to all four sides of workpiece. Fixed gages, along with permanently-mounted surface plates, are at three idle stations so roving inspectors can check accuracy of operations during machining cycle. After all machining operations, pallets pass a major inspection station where clamped parts can be removed from line for checking. At assembly stations, tools do not cycle if back-up units sense the absence of a housing, thus avoiding loss of piece parts. Cross Transfermatic 38-station machine.

Circle 577 on Inquiry Form, page 119, for more data

BRAKE ADJUSTING SCREWS—Automatic assembly. Added efficiency 40 to 80 per cent over manual assembly. Bodine 41-20 Dial Type automatic assembly machine.

Circle 561 on Inquiry Form, page 119, for more data

POWER STEERING VALVES—Automatic assembly. Added efficiency 40 to 50 per cent reduction in direct labor. Bodine 42-30 Dial Type automatic assembly machine.

Circle 562 on Inquiry Form, page 119, for more data

WORMS, STEERING GEAR—Cutting functioning form. Considerable increase in production due to automated loading. Barber-Colman Special External Threading machine, with automatic loading.

Circle 563 on Inquiry Form, page 119, for more data

BRAKE SHOES—Welding. Added efficiency 50 to 100 per cent. Thomson Welder.

Circle 564 on Inquiry Form, page 119, for more data

WHEELS—Forming of wheel rims. Improved efficiency due to line being completely automated. Part is produced automatically. Clearing straight-side press line—one 1000-ton and three 400-ton presses.

Circle 565 on Inquiry Form, page 119, for more data

TRACTOR HYDRAULIC CYLINDERS, REMOTE ACCESSORY—Rough, semi-finish and finish boring, and facing, drilling, reaming, and tapping. Both nodular and gray iron cylinders are processed in the machine, and feeds and speeds can be changed to suit. Strokes also are adjustable to compensate for two different length cylinders. Workpieces are chucked only once. Cross 10-station Trunnion Type machine.

Circle 566 on Inquiry Form, page 119, for more data

BALL JOINT SOCKETS—Stamping. Added efficiency 100 per cent. Danly Transfer Feed press.

Circle 567 on Inquiry Form, page 119, for more data

CHASSIS FRAMES—Piercing. Added efficiency 100 per cent. Danly Hydraulic Piercing machines.

Circle 568 on Inquiry Form, page 119, for more data

BRAKE BACKING PLATES — Stamping. Added efficiency 200 per cent. Danly High-Production press.

Circle 569 on Inquiry Form, page 119, for more data

BRAKE DRUMS—Finish boring. Gross production 96 parts per hour. Ex-Cell-O Model 751 Single-end Precision Boring machine. Bulletin 316019.

Circle 570 on Inquiry Form, page 119, for more data

WHEEL CYLINDERS, HYDRAULIC BRAKE—Rough and finish boring. Gross production rate 312 pieces per hour. Four parts are machined simultaneously. One maker with eight machines boosted total hourly production to 2496 gross. Ex-Cell-O Model 751 Single-end Precision Boring machine. Bulletin 316019.

Circle 571 on Inquiry Form, page 119, for more data

SHOCK ABSORBER PISTONS—Finish machining. Two machines—one finishes 8 surfaces at the net rate of 1046 pieces per hour; the other finishes 10 surfaces at the net rate of 640 pieces per hour. Ex-Cell-O Model 751 Single-end Precision Boring machines. Bulletin 316019.

Circle 572 on Inquiry Form, page 119, for more data

WHEEL HUBS, FRONT—Finish boring and facing. Gross production 224 parts per hour. Both inner and outer bearing seats machined during a single machine cycle. Ex-Cell-O Model 732 Double-end Precision Boring machine. Bulletin 316018.

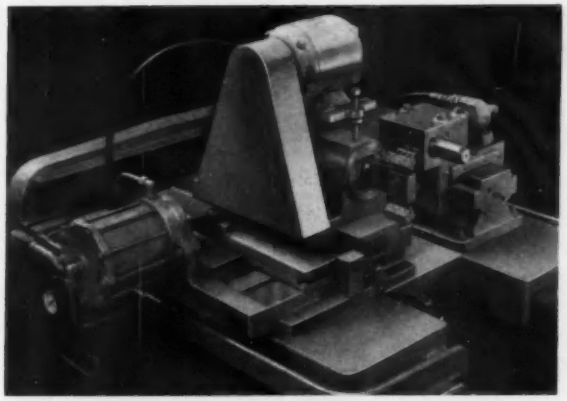
Circle 573 on Inquiry Form, page 119, for more data

FRONT WHEEL SPINDLES — Semi-finish and finish boring. Net production 151 pieces per hour. Angular kingpin holes, 13/16 in. diam and 2⅜ in. long, are bored in accurate relationship to ground diameters on spindle shafts. Ex-Cell-O Model 752 Double-End Precision Boring machine. Bulletin

Circle 574 on Inquiry Form, page 119, for more data

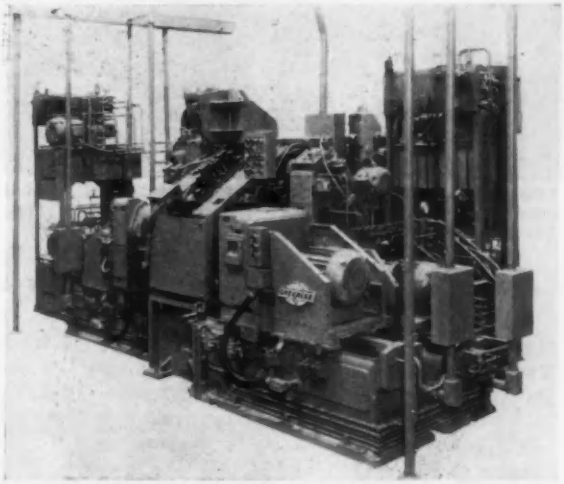
BRAKE SHOES—Grinding OD of lining. Production 1200 pieces per hour at 100 per cent efficiency. Gardner Single Horizontal Spindle Disk grinder, Model 223 drum fixture. Catalog S-56R.

Circle 575 on Inquiry Form, page 119, for more data



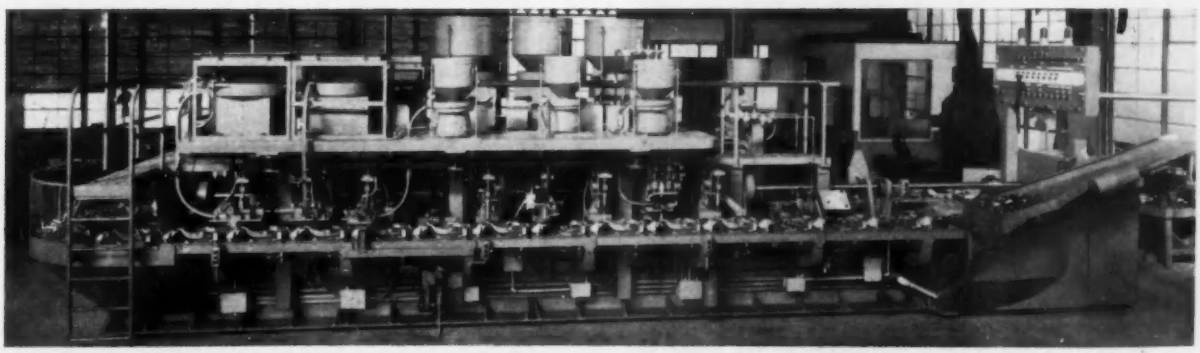
BRAKE DRUMS—Boring, and finishing of braking surface (two operations) in a single handling. Total f-t-f time 3.5 minutes per part. Final finish 15 microinches rms. Workpiece is a 13⅝-in.-diam cast-iron brake drum. Separate front slide on machine carries a boring bar to finish the 2 13/16-in.-deep bore. Superfinishing attachment with stones, mounted on a special rear-slide base and moved into working position by air cylinder, completes operation. Gisholt Simplimatic lathe.

Circle 578 on Inquiry Form, page 119, for more data



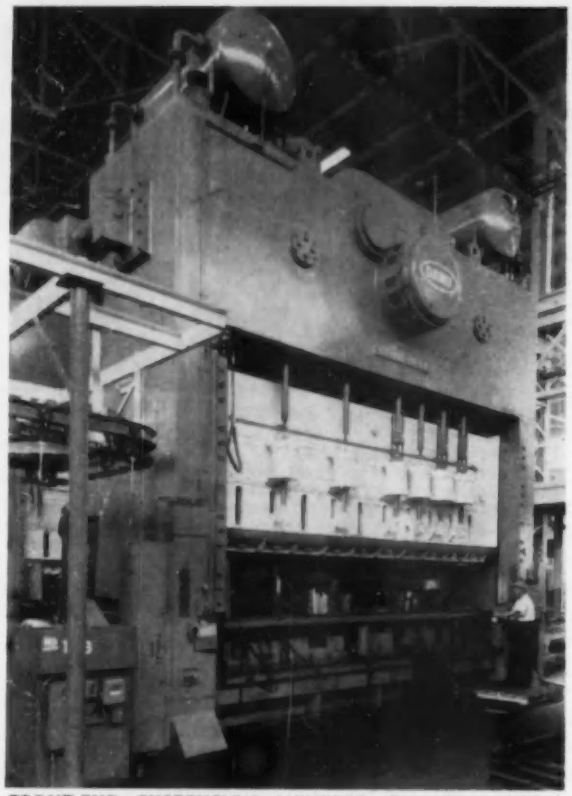
WHEEL CYLINDERS, HYDRAULIC BRAKE—Boring, facing, reaming, chamfering, and milling. Production 824 pieces per hour at 100 per cent efficiency; 660 pieces per hour at 80 per cent efficiency. Workpiece is of cast iron. Greenlee Four-Way 4-station Horizontal Automatic Indexing machine.

Circle 579 on Inquiry Form, page 119, for more data



FRONT SUSPENSIONS—Assembling (Ford). Two Gilman Dial Type Indexomatics assemble upper and lower ball joint assemblies, at the rate of 1200 assemblies per hour, gross (each machine). Then four Gilman 26-station Carousel Type Indexomatics (pictured) assemble the ball joints to upper and lower right-hand and left-hand suspension arms, as well as other component parts, to complete the assemblies. Production of each of these machines is 620 assemblies per hour, gross.

Circle 580 on Inquiry Form, page 119, for more data

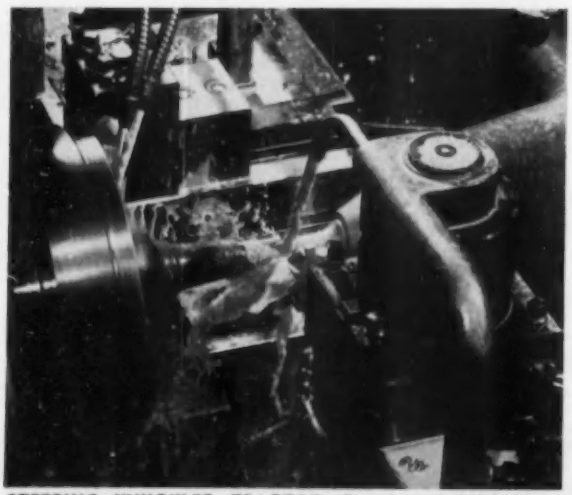


FRONT-END SUSPENSION MEMBERS—Stamping. Added efficiency 100 per cent. Danly Transfer Feed press, Type SS2-1000-216.

Circle 593 on Inquiry Form, page 119, for more data

HYDRAULIC PUMP ROTORS—Grinding. Production 750 pieces per hour at 100 per cent efficiency. Two cuts. Gardner Model 2H30 Rotary Carrier Double Disk grinder. Catalog D-60.

Circle 594 on Inquiry Form, page 119, for more data



STEERING KNUCKLES, TRACTOR—Rough and finish turning of bearing diameters. Total cycle time, including handling, is 1.187 minutes per piece. Workpiece is an SAE 5135 forging. Carbide cutting tools are used. Bearing diameters are turned at 1120 rpm and 16 in. feed per minute. Monarch Model 21-H Mona-Matic lathe.

Circle 595 on Inquiry Form, page 119, for more data

STEERING GEAR WORMS—Finish grinding of bearing race. Gross production 225 parts per hour. Machine automatically grinds bearing races on two worms simultaneously. Periodic wheel-dressing also performed automatically. Ex-Cell-O Model 973 Precision Groove and Form grinder. Bulletin 5060124. (The worm form is rough and finish ground on an Ex-Cell-O Style 33 Thread grinder.)

Circle 581 on Inquiry Form, page 119, for more data

STEERING GEAR BALL-RACE NUTS—Finish grinding. Production of the parts on similar equipment was 17 per hour in 1939; with equipment of advanced design, production climbed to 24 per hour in 1946; and at present, with this latest automated machine, production has increased to 50 parts per hour. Ex-Cell-O Model 39-A Precision Internal Thread grinder. Bulletin 48521.

Circle 582 on Inquiry Form, page 119, for more data

STEERING GEAR NUTS, CIRCULATING BALL TYPE—Rough and finish Scru-broaching. A production threading machine for large nuts, especially those having fast leads. Tools resemble spiral-fluted taps, but cut like broaches. Two work stations with separate controls. Rough and finish operations performed at each. Ex-Cell-O Scru-Broach machine. Bulletin 50054.

Circle 583 on Inquiry Form, page 119, for more data

STEERING CLUTCH AND GEAR HOUSINGS—Finish boring and line boring. Massive weldment weighs 4000 lb. Right and left-hand slides of machine carry five spindles each. Tolerances on 7¾ in. and 8⅝ in. diam holes held to ±0.001 in.; and a 9¼ in. diam hole is held to ±0.0005 in. Ex-Cell-O Custom Horizontal Precision Boring machine. Bulletin 505911.

Circle 584 on Inquiry Form, page 119, for more data

POWER STEERING PUMP COVERS—Bor-drilling. Net production 180 parts per hour. Bor-Dril 3/16 in. diam, 3⅛ in. long holes from solid in a single pass. Straight accurate holes have a surface finish of 20 microinches rms or better. Ex-Cell-O Model 751 Single-end Precision Boring machine. Bulletins 316019 and 311162.

Circle 585 on Inquiry Form, page 119, for more data

STEERING GEAR HOUSINGS — Core-drilling, reaming, plunge-facing, spotfacing, chamfering, and tapping. Net production 54 pieces per hour. Fixture has two stations. Cast aluminum parts are core-drilled in lower station, reloaded, and finished in upper station. Thus, roughing operations are done on one part and finishing operations on another during each cycle. Ex-Cell-O Custom Boring and Drilling machine with three Model 28-A Ex-Cell-O Quill-Type Hydraulic Power units. Bulletins 50155, 505911, and 45352.

Circle 586 on Inquiry Form, page 119, for more data

BUSHING AND O-RING ASSEMBLIES—Assembling. Production 3600 assemblies per hour, gross. Bushings are hoppered, oriented, and fed into confining guide rails by a herringbone belted, elevator type feeder. Presence and orientation are checked. Then the O-rings are hoppered, released and loaded into internal annular grooves in the bushings by special tooling on cam-controlled movements. Assemblies are checked for completeness, and auto-unloaded. Any faulty assemblies are diverted. Gilman 10-station, 6-in. TRANSFERLINE Assembly machine, tandem-tooled.

Circle 587 on Inquiry Form, page 119, for more data

SHOCK ABSORBERS — Assembling pistons and valving, both 1 in. and 1 3/16 in. piston diameters. Production 1565 assemblies per hour, gross. Rod and support washer are manually loaded and assemblies manually unloaded. Automatic operations include: set rod height; load, form and check one-inch intake valve spring; hopper and load rod guide; load, form and check 1 3/16 in. intake valve spring; load and check intake valve; hopper, load and check 1 in. or 1 3/16 in. piston; load and check spring disk; load and check back plate; hopper, load and check spring seat; hopper load and check spring (nine optional sizes); hopper, load and torque nut; reject incomplete assemblies; press tube to complete good assemblies. Gilman 24-station, 6-in. TRANSFERLINE Assembly machine.

Circle 588 on Inquiry Form, page 119, for more data

SHOCK ABSORBER PISTON RODS—Grinding, and hardening. Production rate 960 parts per hour. Parts are processed on an automatic continuous-flow production line that includes five Cincinnati No. 2 Centerless Grinding machines, plus a Cincinnati RF Inductron Heating machine that induction-hardens the center section of part.

Circle 589 on Inquiry Form, page 119, for more data

BEARING CAGES—Drilling, boring, countersinking, reaming, and tapping. Production 54 pieces per hour at 100 per cent efficiency; 44 pieces per hour at 80 per cent efficiency. Workpiece is of malleable iron. Greenlee Two-Way Horizontal 4-station Shuttle Type machine.

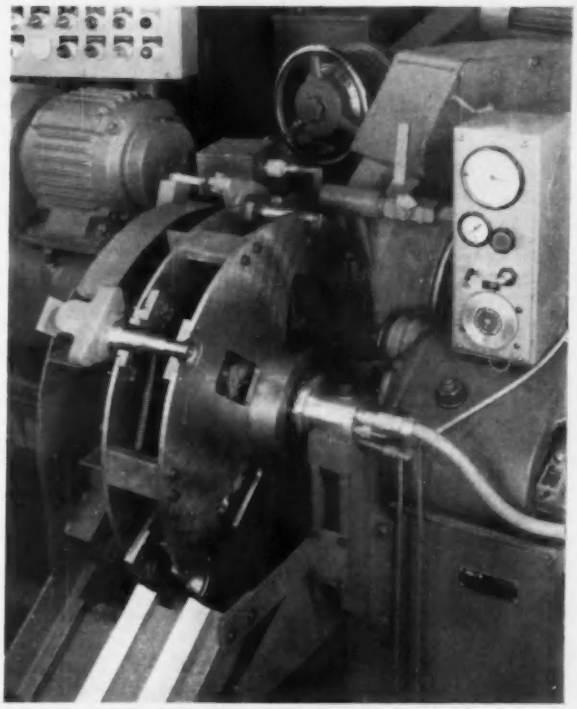
Circle 590 on Inquiry Form, page 119, for more data

STEERING GEAR HOUSINGS—Drilling, boring, chamfering, milling, reaming, and tapping. Production 300 pieces per hour at 100 per cent efficiency; 240 pieces per hour at 80 per cent efficiency. Workpiece is of malleable iron. Greenlee Automatic Transfer machines—20-station, 28-station, 13-station, and 35-station.

Circle 591 on Inquiry Form, page 119, for more data

SHOCK ABSORBER PISTONS—Turning, grooving, and chamfering. Added efficiency 50 per cent. Heald Model S Bore-Matic boring machine.

Circle 592 on Inquiry Form, page 119, for more data

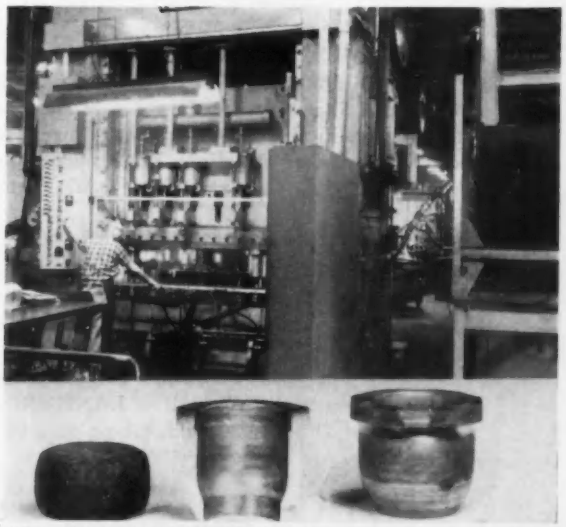


FRONT WHEEL SPINDLES—Grinding two diameters and adjacent radii. Added efficiency 24 per cent over Type CH machine. Landis Tool Co. Type R Automatic Plunge Grinding machine.

Circle 596 on Inquiry Form, page 119, for more data

STEERING GEAR WORMS—Rolling from turned blank. Up to 30 times faster than hobbing. Michigan 3000 Series Roto-Flo machine. Bulletin RF-60.

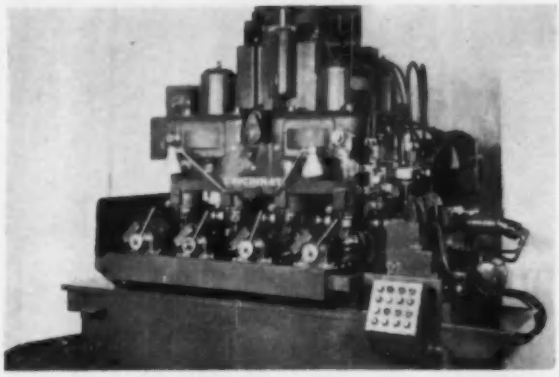
Circle 597 on Inquiry Form, page 119, for more data



BALL JOINT HOUSINGS—Impact machining (extruding). Production 26 pieces per minute; 1560 per hour. Savings in material approximately 65 per cent over machining from solid bar stock. Material SAE 1112 modified steel, hot-rolled, bar form, random lengths. Process operations are shear hot rolled bar, head to size, anneal and lubricate, extruding in press, pierce and coin to size, finish undercut and machine, and heat treat. Verson Model ES-2-1000-84-54T Transmat Extrusion Press.

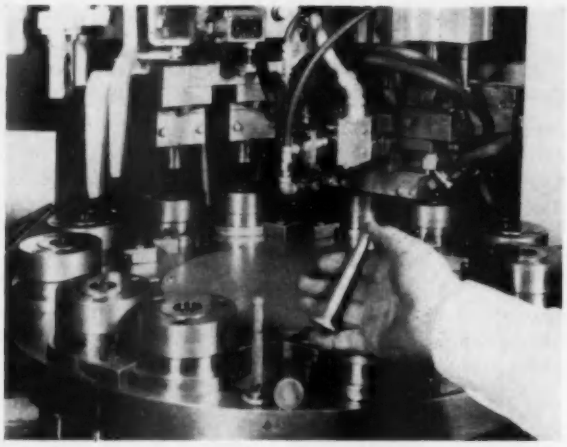
Circle 598 on Inquiry Form, page 119, for more data

Making CHASSIS Production *PAY*



STEERING GEAR CAMS—Milling worm lead. Production 32 pieces per 48-minute hour. Stock removal from solid. Equipment includes three-dimensional tracer; special four-spindle vertical head; fixture integral with machine table and customer's master tracing station. Completely automatic cycle. During machining, carrier rapids down, feeds to depth with workpiece rotating. After helical cut is to length, carrier feeds up and returns to starting position. In finishing cycle, only 0.020 in. more stock is removed. Cincinnati Special Four-Spindle Vertical Hydrotel Profile-Milling machine.

Circle 614 on Inquiry Form, page 119, for more data



TIRE VALVE STEMS—Hot-upsetting 0.455-in.-diam brass rod on one end, forming a blank. Production rate 1800 pieces per hour. Machine consists of loading station, heating station, upsetting station, and automatic pick-off station. Total upset force is 50,000 lb. Taylor-Winfield Special Six-Station Dial-Feed Hot-Upsetting machine, 125 kva.

Circle 615 on Inquiry Form, page 119, for more data

WHEEL STUDS, TRACTOR—Turning, straddle-milling, shaving, chamfering, thread-rolling, and cut-off. Production 48 pieces per hour, gross. Workpiece is of SAE 1035 heat-treated steel. Greenlee 1⅝-in., 6-Spindle Automatic Bar machine.

Circle 599 on Inquiry Form, page 119, for more data

WHEEL SPINDLES—Burnishing radius on spindles shaft. A new process which increases fatigue life of part. Michigan Roto-Flo Model 1026 Roller Burnisher. Bulletin 1026-61.

Circle 600 on Inquiry Form, page 119, for more data

BALL JOINT STUDS—Thread rolling. Production 160 parts per minute. Threads are ½-in., 20-pitch, UNF, Class 2A. Machine is fully automatic, using double-segment dies producing two threaded pieces each revolution of the dies. Landis Machine Co. 24PW LANHYROL Thread Rolling and Forming machine.

Circle 601 on Inquiry Form, page 119, for more data

TIE ROD ENDS—Thread rolling. Production 80 parts per minute. Threads are ¾-in., 18-pitch, AN. Machine is fully automatic, using single-segment dies producing one threaded piece per revolution of the die. Landis Machine Co. 24PW LANHYROL Thread Rolling and Forming machine.

Circle 602 on Inquiry Form, page 119, for more data

POWER STEERING STUDS—Thread rolling. Production 190 pieces per hour at 100 per cent efficiency. Threading attachment has produced over one million studs with one set of rolls. Produced are ½-in., 20-pitch, UNF, Class 2A threads on 8115 or equivalent bar stock. Attachment is mounted on a 1⅝-in. RA8 Acme-Gridley machine. Landis Machine Co. 20GA LANROLL Thread Rolling attachment.

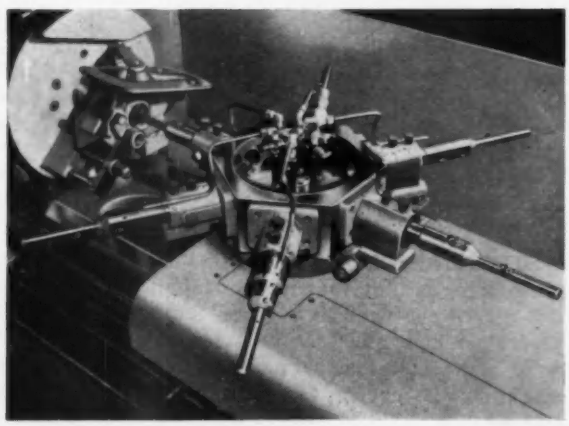
Circle 603 on Inquiry Form, page 119, for more data

TAPERED INNER BEARING RACES—Grinding thrust face and 30-deg corner radius, including roller pathway. Added efficiency 30 per cent over present practice. Machine is designed to fit into a production line where machines are placed side by side. It has automatic loading, grinding, sizing, and unloading. Landis Tool Co. Type R Automatic Concentric grinder.

Circle 604 on Inquiry Form, page 119, for more data

STEERING GEAR PARTS—Rolling of splines, serrations, grooves, threads, and similar forms. Up to 30 times faster than hobbing. Michigan 3000 Series Roto-Flo machine. Bulletin RF-60.

Circle 605 on Inquiry Form, page 119, for more data



TRACTOR STEERING GEAR HOUSINGS—Rough, semi-finish, and finish boring, chamfering, and facing. Time f-t-f 3.5 minutes per piece. Bores in workpiece are 2¾-in.-diam at front and 1¼-in.-diam at back. Back bore is held within 0.0005 in. Gisholt 2F Fastermatic Automatic Chucking Turret lathe, with special counterbalanced fixture and double tooling.

Circle 616 on Inquiry Form, page 119, for more data

STEERING KNUCKLES—Grinding of line diameters and shoulders. Added efficiency up to 60 per cent over conventional angular grinders. New machine with wider wheels combines operations previously requiring more than one machine. Machine also has automatic loading and unloading of workpieces. Higher wheel speed could increase productivity still more. Norton Type CP-1 PLUNGE-O-MATIC Grinding machine.

Circle 606 on Inquiry Form, page 119, for more data

BALL JOINTS—Turning, facing, burnishing face and OD. Added efficiency 37 per cent over 1¼-in. RA-6 bar machine. Part originally made from bar stock; now a cold press forging. National Acme Co. 1-in. RA-6 Second-Operation machine.

Circle 607 on Inquiry Form, page 119, for more data

PITMAN SHAFTS—Forging. Production up to 8300 per eight-hour shift. National Machinery 3-in. Automatic Tong-Feed Forging machine.

Circle 608 on Inquiry Form, page 119, for more data

STEERING KNUCKLES—Grinding of line diameters and shoulders. Added efficiency up to 50 per cent over conventional angular grinders. New machine with wider wheels combines operations previously requiring more than one machine. Higher wheel speed could further increase productivity. Norton 10-in. Type CV-4 or 14-in. Type LCV-4 Semi-Automatic Angular Wheelslide Grinding machine.

Circle 609 on Inquiry Form, page 119, for more data

STEERING KNUCKLES—Drilling, turning, milling, and facing. Added efficiency 28 per cent over prior practice. National Acme Co. 10-in. RPA-6 machine.

Circle 610 on Inquiry Form, page 119, for more data

FRONT WHEEL BEARING RACES—Slug shearing, piercing, and extruding. Cold extrusion process permits manufacture of inner and outer races from one piece of material, up to final heat-treat and grinding stages. Material savings, and reduced grinding costs. Material SAE or AISI 4620 alloy steel in hot-rolled bar form. Extrusion equipment consists of three separate units, each with independent hopper feed and safety and checking control units for full automatic operation. Verson Model EC-1-300-36-36T combination slug shear and sizer, with automatic bar storage stand, bar feed press shear die, automatic bar end disposer, sizing dial, and checking equipment. Verson Model EC-2-800-54-48T Transmat extrusion press unit, including Transmat dies and feed, hopper feed unit, and checking control. Verson Model EC-2-600-54-48T dial-type press and dial unit, including dies, hopper and automatic unloader. Latter unit completes extrusion of both inner and outer races, separates the two races, and coins to size.

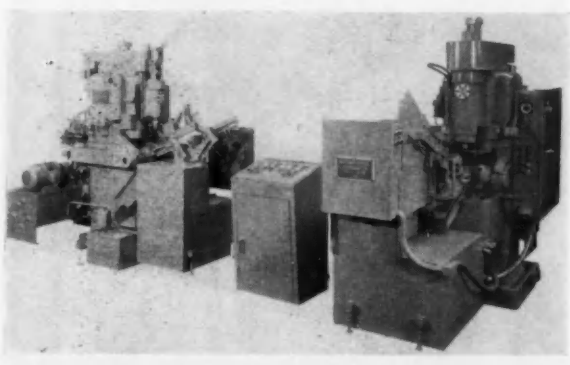
Circle 611 on Inquiry Form, page 119, for more data

STEERING KNUCKLES—Milling of multiple surfaces. Production 106 parts per hour at 80 per cent efficiency. Left-hand parts are milled at one end of table, while right-hand parts are milled at other end of table. No machine time lost while loading. Sundstrand Standard Milling machine with special tooling.

Circle 612 on Inquiry Form, page 119, for more data

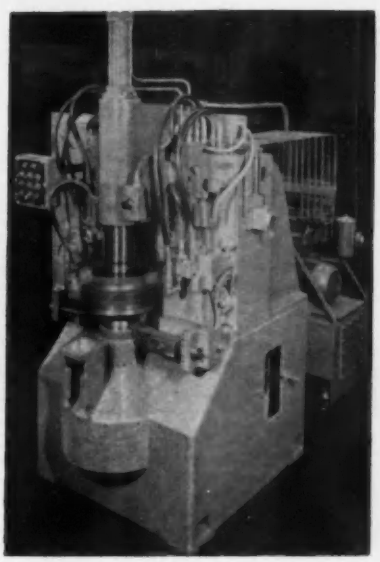
BRAKE SHOES—Welding 3/16 in. web to ⅛-in. plate, and forming. Pre-formed web is inserted in lower welder die and flat plate is fed in between die and upper circular electrode. Part is formed and projection-welded in a single rolling motion. Taylor-Winfield Special Brake Shoe Roll-Welder, 250 kva.

Circle 613 on Inquiry Form, page 119, for more data



BALL STUDS—Milling, and Microhoning. Added efficiency 40 per cent over turning, grinding, and polishing. The two machines may be operated independently; or integrated as illustrated in which the spherical ends of automotive ball studs are completely machined in two operations following cold-heading. Micromatic Model 5VMB Milling and Model 2VB Microhoning machines.

Circle 617 on Inquiry Form, page 119, for more data

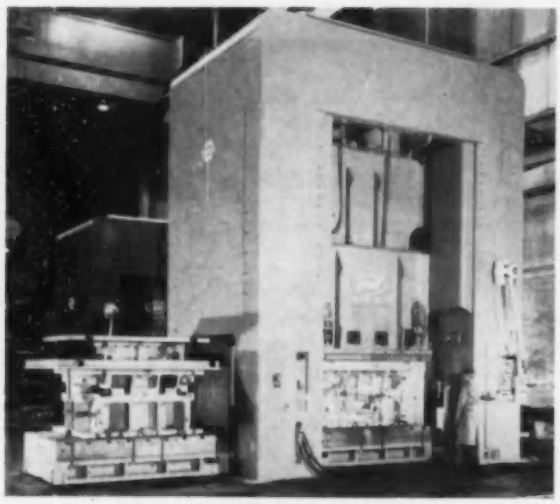


BRAKE DRUMS—Finish-turning of braking surface. Production 75 parts per hour at 80 per cent efficiency. Machine features ease of loading and operation. Ceramic tooling used. Sundstrand Model 59 Vertical Brake Drum lathe.

Circle 618 on Inquiry Form, page 119, for more data

Making BODY Production PAY

Panels, door locks and gears, hardware, window regulators, seat frames and adjusters, etc.



BODY PANELS, HOODS AND OTHER PARTS—Stamping. Increase in press utilization 150 per cent. Danly QDC (quick die change) Double-Action press. Bulletin QDC-1.

Circle 627 on Inquiry Form, page 119, for more data

TRUNK LID HINGES — Forming by bending. Parts are formed on two presses at an estimated rate of about 900 bends per hour. In addition, a detent for holding the lid in open position is produced, eliminating the necessity for a secondary punch-press operation. Pines Model 20-T Hydraulic Bending Press. Catalog 379.

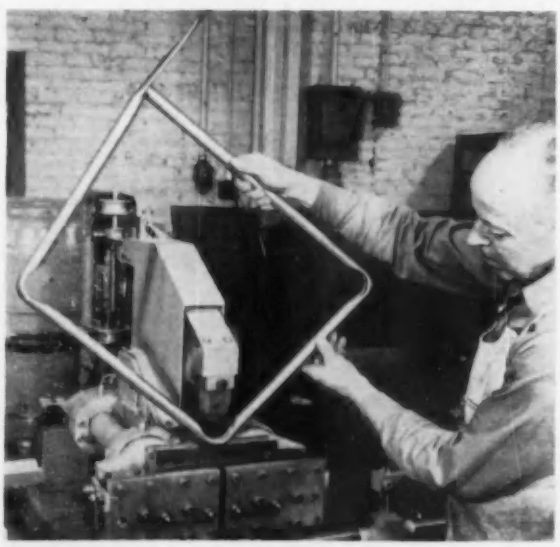
Circle 619 on Inquiry Form, page 119, for more data

BODY PANELS, HOODS AND OTHER PARTS—Stamping. Added efficiency 100 per cent. Danly Double and Triple Action presses.

Circle 620 on Inquiry Form, page 119, for more data

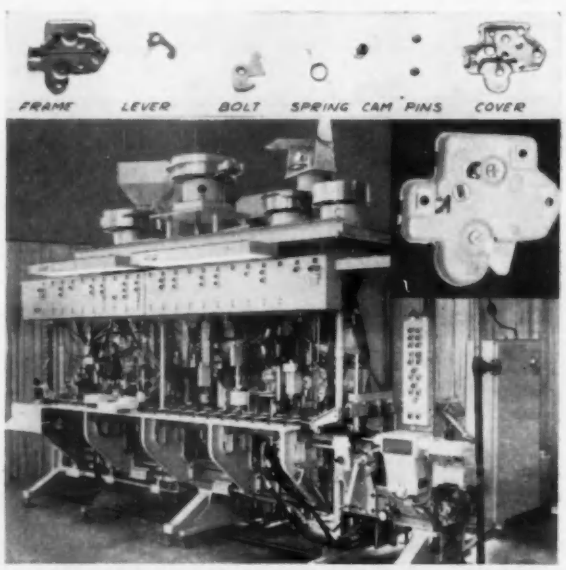
DOOR HANDLES—Drilling and tapping. Added efficiency 30 to 40 per cent over single-spindle operations. Bodine 42-30 Dial Type machine.

Circle 621 on Inquiry Form, page 119, for more data



SEAT FRAMES—Forming by bending. Production between 700 and 800 bends per hour, compared to 240 bends per hour from a conventional rotary bending machine. Pines Model 5-T Hydraulic Bending Press. Catalog 379, News 54.

Circle 628 on Inquiry Form, page 119, for more data



REAR COMPARTMENT LID LOCKS—Assembling, two different sizes. Production 1200 assemblies per hour, gross. Automatic operations include loading of small parts, staking, greasing, tab folding, and functional checking. Gilman 22-station, 6-in. TRANSFERLINE Assembly machine.

Circle 629 on Inquiry Form, page 119, for more data

WINDOW REGULATOR CLUTCHES — Assembling. Production 3600 assemblies per hour, gross. All operations fully automatic, including: hopper and load two clutch cases; hopper, load and check two polyethylene spacer rings; coat clutch cases with grease; hopper, coil up, load and check two springs; apply grease to springs; auto-unload completed assemblies, diverting any incompleted assemblies. Gilman 8-station, 6-in. TRANSFERLINE Assembly machine, dual-tooled.

Circle 622 on Inquiry Form, page 119, for more data

SEAT ADJUSTER ACTUATING SCREWS—Rolling of threads. Continuous thru-feed rolling at the rate of 75 ipm. Full-formed triple-lead Acme thread is ½ in. diam. Reed Model A-23 Horizontal Three Cylindrical Die Type Thread Rolling machine.

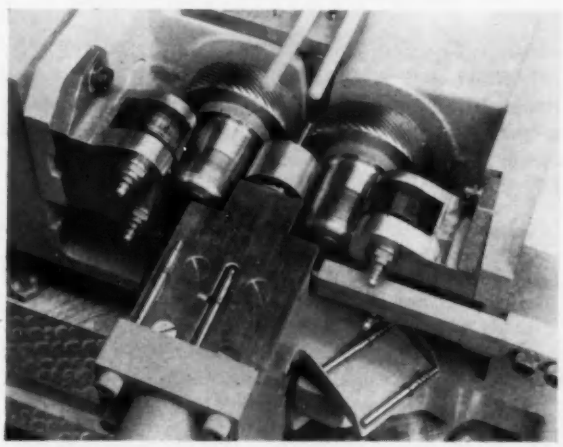
Circle 623 on Inquiry Form, page 119, for more data

DASHBOARD CONSOLES — Blending machine marks, deburring, or deflashing. Minimum of 35 per cent increased efficiency over manual and machine finishing. Production 500 pieces per hour. Airless blast mechanical finishing of aluminum or magnesium die-cast parts. Wheelabrator Monorail Cabinet.

Circle 624 on Inquiry Form, page 119, for more data

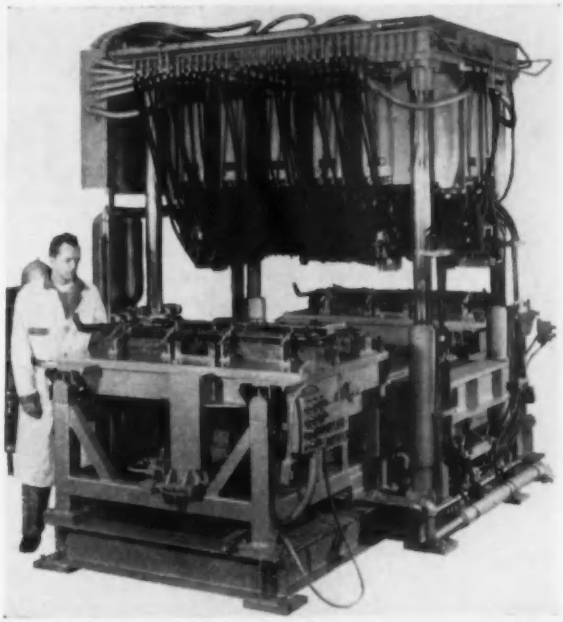
SEAT ADJUSTER GEAR NUTS — Rolling of threads. Production rate 20 pieces per minute. Gear nuts are ⅞ in. diam., rolled with both single and triple lead helical worm threads. Continuous thru-feed rolling. Blanks are manually loaded into loading tube mounted vertically above dies, and are discharged out the side of machine after automatic feeding through forming dies. Reed Model A-22 Vertical Three Cylindrical Die Type Thread Rolling machine.

Circle 625 on Inquiry Form, page 119, for more data



SEAT ADJUSTER SCREWS—Rolling of threads. Production rate 16 pieces per minute. Thread is 5/16 in. OD, 28 D.P. worm. Reed Model B-111 Horizontal Two Cylindrical Die Type Thread Rolling machine, equipped with semi-automatic work-handling equipment

Circle 630 on Inquiry Form, page 119, for more data

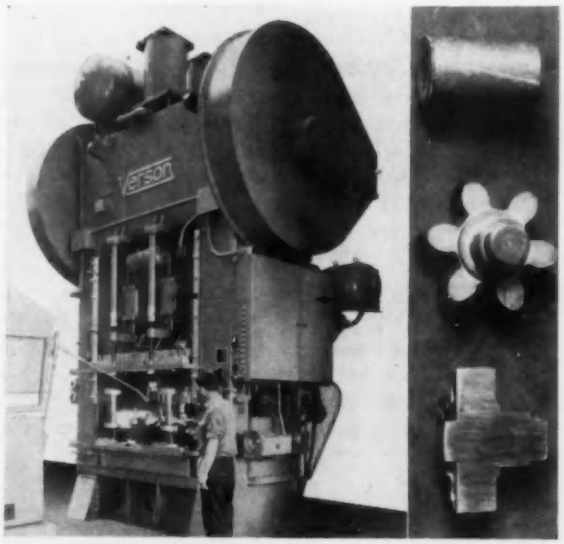


SEAT FRAMES—Assembling by welding. High-production welding of cross wires and wire to stamping, to form automobile seat cushion backs and bottoms. Taylor-Winfield Special Four-Post Double-Shuttle Multi-Gun (73) Welder Press, 1610 kva.

Circle 631 on Inquiry Form, page 119, for more data

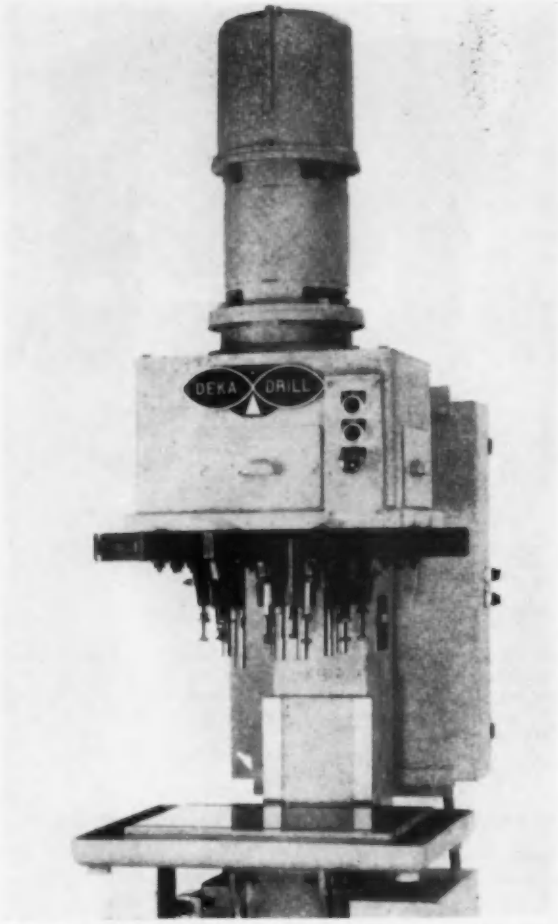
INNER FENDER SKIRTS—Piercing 62 mounting holes and shearing pair of skirts in two, with one stroke. Added efficiency 300 per cent. Danly Special 60-ton mechanical press, having dies with built-in hydraulic piercing cylinders. Bulletin SDP-1.

Circle 626 on Inquiry Form, page 119, for more data



DOOR LOCK GEARS—Impact machining. Production 60 pieces per minute; 3600 per hour. Operations are process shear and head stock into slugs, anneal, zinc phosphate lubricate, extrude in two blows. Material SAE 1010 to 1013 steel, in hot-rolled coil or bar form. Verson Model EC-2-500-60-48T Extrusion Press with dial tooling and automatic loading and checking.

Circle 632 on Inquiry Form, page 119, for more data



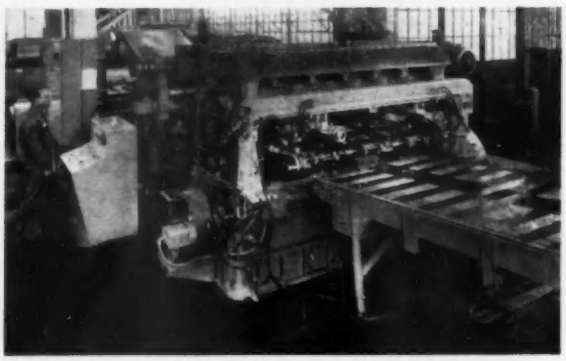
BODY PARTS—Tapping. Machine taps 14 holes simultaneously at the rate of 60 cycles per minute. DEKA DRILL Multiple-Spindle High-Speed Tapper. Bulletin 146.
Circle 639 on Inquiry Form, page 119, for more data

BUMPERS—Welding mounting brackets to bumper shell. Four-arc automatic MIG welder simultaneously deposits four CO_2 gas-shielded welds. Bumper shell is manually loaded and automatically indexed into welding position. Brackets are manually loaded after shell is in weld station. Taylor-Winfield Special Arc Welder.
Circle 633 on Inquiry Form, page 119, for more data

DOOR VENT. GLASS RETAINERS — Bending frames of re-formed channel. Production rate approximately 700 pieces per hour. Three parts bent at a time. Taylor-Winfield Special Model 12-HSW-2 Single Wing Tangent Bender, hydraulically operated.
Circle 634 on Inquiry Form, page 119, for more data

DOOR PANELS, HOUSINGS, DASH PANELS, ARM RESTS, ETC.—Fabricating by custom plastic molding. Reduction of cost 30 to 80 per cent. Materials feature light weight; ease of finishing and assembling. CHIPFORM product has properties of wood. Gisholt MASTERGLAS fiberglass-reinforced plastics, and CHIPFORM wood-chip plastics.
Circle 635 on Inquiry Form, page 119, for more data

ROOFS, BOWS, HIGHWAY TRAILERS—Forming by bending. Workpiece is a complex four-leg extrusion of 6063-T6 aluminum alloy that is bent 90-deg on a 12-in. outside radius without breakage, marring, wrinkles or distortion between the two bends. Tolerance is ± 2 deg, but parts are consistently produced with an angle accuracy of ± ½ deg. Pines Model 2 Rotary Bending machine. Catalog 356, News 55.
Circle 640 on Inquiry Form, page 119, for more data



BODY PARTS—Shearing blanks from coil stock. Cuts made at up to 90 per minute. Back gage attachment, a recent development, provides for cutting short lengths of from 4 to 18 in. When using back gage, the flying shear is held stationary. The strip, hitting rubber gage blocks preset to length desired, activates shear. Flying shear operation is used for cutting longer blanks. The McKaymatic Die Shear Line is equipped with a cone-type coil holder rated to 20 tons, and with a 17-roll leveler.
Circle 641 on Inquiry Form, page 119, for more data

HARDWARE AND DECORATIVE PARTS—Mechanical finishing prior to plating. Output depends on part size, as well as condition of surface to be finished. Production on many small parts exceeds 1500 per hour. Grav-i-Flo Spin-Finish machine.
Circle 636 on Inquiry Form, page 119, for more data

SPEEDOMETER FACES—Deflashing and surface finishing. Decrease in finishing time at least 50 per cent. From 11,520 to 14,400 parts deflashed in eight hours. Part is a zinc die casting. Wheelabrator Multi-Table Airless Blast machine.
Circle 637 on Inquiry Form, page 119, for more data

BODIES, AUTOMOBILE AND TRUCK—Layout and parts checking. Reduction in layout and checking time as much as 80 per cent. Portage Layout machine.
Circle 638 on Inquiry Form, page 119, for more data

Making ELECTRICAL Production PAY

Distributor housings, cams, shafts and gears, starting motor housings, armatures, gears and shafts, generator and alternator shafts, spark plugs, etc.

DISTRIBUTOR DRIVEN GEARS—Hobbing of teeth. Increase in production 100 per cent. Barber-Colman No. 4-6 Vertical Hobbing machine, with automatic loading.

Circle 642 on Inquiry Form, page 119, for more data

STARTING MOTOR AND GENERATOR END HOUSINGS—Drilling, reaming, inserting bushings, and sizing. Added efficiency 60 per cent over separate operations. Bodine 48-30 Dial Type machine.

Circle 643 on Inquiry Form, page 119, for more data

ELECTRICAL CONTACTS—Automatic welding, drilling, tapping, and screw inserting. Added efficiency 86 per cent over manual operations. Bodine 42-30 Dial Type machine.

Circle 644 on Inquiry Form, page 119, for more data

MOTOR LAMINATIONS—Stamping. Added efficiency 200 per cent. Danly Autofeed presses, Series H.

Circle 645 on Inquiry Form, page 119, for more data

DISTRIBUTOR BASES—Drilling, tapping, spotfacing, counterboring, and chamfering. Production rate 150 per hour. Workpiece is cast iron Ex-Cell-O Custom 5-station Multiple-Spindle Rotary Indexing machine. Bulletins 50155 and 505911.

Circle 646 on Inquiry Form, page 119, for more data

DISTRIBUTOR BASES—Bor-drilling. Production 116 pieces per hour. Bor-Dril process finish-machines $\frac{5}{8}$ in. diam, $6\frac{7}{8}$ in. long hole from the solid, straight and wound within 0.0005 in., and with a finish of 15 microinches rms. Ex-Cell-O Model 731 Single-end Precision Boring machine. Bulletins 316018 and 311162.

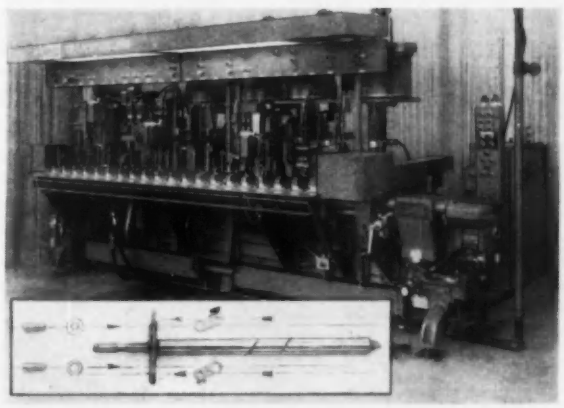
Circle 647 on Inquiry Form, page 119, for more data

SPARK PLUG CENTER WIRES—Grinding. Production 45,000 pieces per hour at 100 per cent efficiency—output tripled over former method. Gardner Model IV18, 18 in. Rotary Carrier Single Spindle Disk grinder.

Circle 648 on Inquiry Form, page 119, for more data

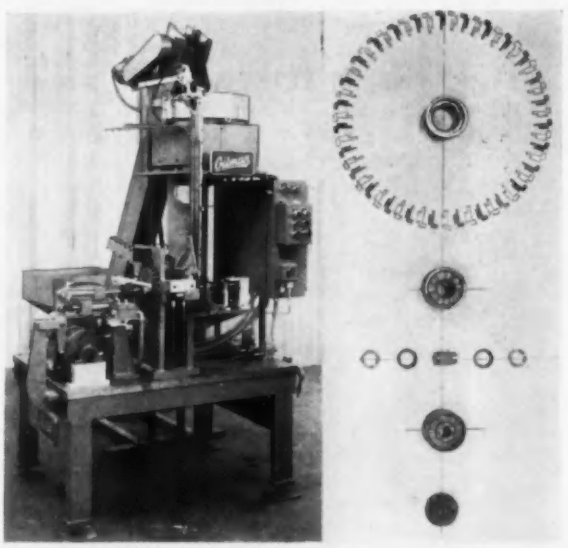
DISTRIBUTOR SHAFTS—Grinding of ends. Production 240 pieces per hour at 100 per cent efficiency. Gardner Model 2H30 Rotary Carrier Double Disk grinder. Catalog D-60.

Circle 649 on Inquiry Form, page 119, for more data



DISTRIBUTOR SHAFTS — Assembling parts. Production 1200 assemblies per hour, gross. Automatic operations performed include: hopper, load and check two shoulder pins; hopper, load and check two washers; load and check shaft assembly (right, or left-hand); hopper, load and check two right-hand or left-hand spring lugs; spin over shoulder pins; hopper, load and upset two semi-tubular rivets. Gilman 22-station, 6-in. TRANSFERLINE Assembly machine.

Circle 650 on Inquiry Form, page 119, for more data



STARTING MOTOR COMMUTATORS — Assembling. Production 218 assemblies per hour (up to 6540 segments and 6540 insulators per hour). Machine automatically feeds, escapes and loads copper segments and mica insulators. Gilman Commutator Assembly machine.

Circle 651 on Inquiry Form, page 119, for more data

Making ELECTRICAL Production *PAY*

DISTRIBUTOR CAMS—Grinding of contour. Added efficiency 90 per cent over single-head distributor cam grinder. Newer machine allows the grinding of two distributor cams at the same time, thus almost doubling production. Norton Double-Head Distributor Cam Grinding machine.

Circle 652 on Inquiry Form, page 119, for more data

STARTER ARMATURES—Rough and finish turning, and facing. Production 350 pieces per hour at 100 per cent efficiency. Materials copper and steel. Motch & Merryweather Model 1V Vertical Turner.

Circle 653 on Inquiry Form, page 119, for more data

DISTRIBUTOR HOUSINGS — Turning diameter. Production about 750 per hour. Motch & Merryweather Four-Spindle Precision Turning machine.

Circle 654 on Inquiry Form, page 119, for more data

GENERATOR HOUSINGS — Trimming - off end, and facing and chamfering both ends. Production about 900 per hour. Motch & Merryweather Special Three-Station Transfer-Type Turning machine with magazine load, and automatic ejection.

Circle 655 on Inquiry Form, page 119, for more data

DISTRIBUTOR CAPS—Deflashing of molded plastic parts. At least a 75 per cent decrease in deflashing time and an equal decrease in costs over manual deflashing methods. Wheelabrator Plastics Deflasher.

Circle 656 on Inquiry Form, page 119, for more data

DISTRIBUTOR HOUSINGS—Boring and facing. Added efficiency 50 per cent. Heald Model 322 Auto-Load Bore-Matic boring machine.

Circle 657 on Inquiry Form, page 119, for more data

ALTERNATOR SHAFTS—Knurling. Production 30 parts per minute. Completely automatic machine produces 53-tooth, 0.040-in. pitch, 90-deg tooth knurl. Infeed method of rolling used. Landis Machine Co. 24PW LANHYROL Thread Rolling and Forming machine.

Circle 658 on Inquiry Form, page 119, for more data

SPARK PLUG BODIES—Cold forming. Production rate 50 per minute. National Machinery No. 750 Seven-Station Cold Former.

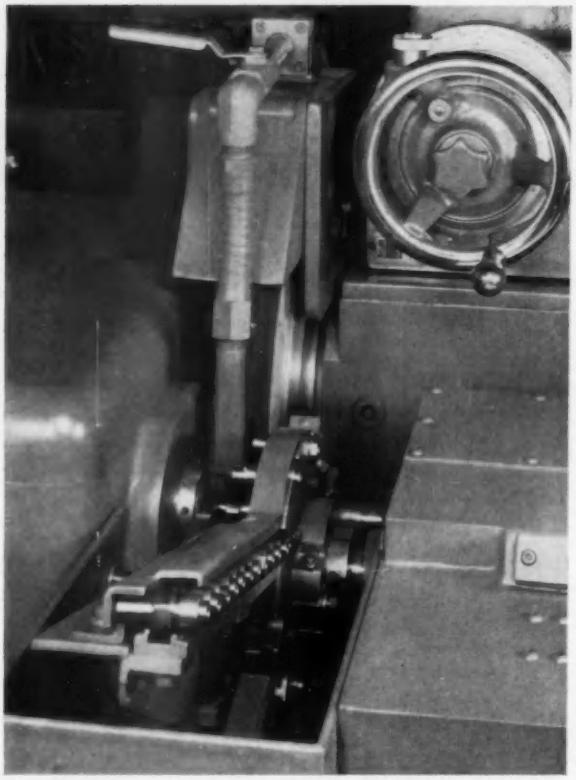
Circle 659 on Inquiry Form, page 119, for more data

DISTRIBUTOR CAM BEARINGS — Grinding. Added efficiency 30 per cent over prior practice. Landis Tool Co. Type H Chucking grinder.

Circle 660 on Inquiry Form, page 119, for more data

STARTER GEARS—Cutting all teeth simultaneously. Output 10 to 16 times that with hobbing. Michigan 1800 Series Shear-Speed Gear Shaper. Bulletin SS-55.

Circle 661 on Inquiry Form, page 119, for more data



DISTRIBUTOR CAMS—Rough, and finish grinding. Added efficiency 40 per cent over prior practice. Machine has two spaced grinding wheels. One wheel is for rough grinding; the other for finish grinding. After rough grinding, wheelhead shifts laterally for removal of 0.001 in. of stock with finishing wheel. Loading and unloading are automatic. A rotary indexing type carrier is used to carry the parts to load position and to discharge chute. Landis Tool Co. Automatic Distributor Cam grinder.

Circle 665 on Inquiry Form, page 119, for more data

BEARING RACES, STARTERS AND GENERATORS—Grinding. Production 2500 per hour at 100 per cent efficiency. Both inner and outer races. Gardner Model 2H20 Feed-Thru Double Disk grinder. Catalog D-60.

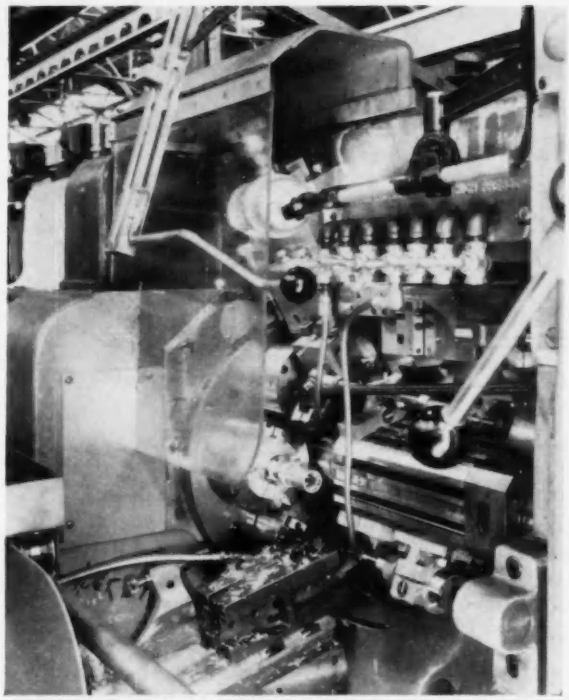
Circle 662 on Inquiry Form, page 119, for more data

WINDOW MOTORS—Hot-staking wires to commutator segments. Part is automatically indexed for successive operations on all 28 commutator segments. Eight tungsten electrodes provided on welding heads for rapid electrode change. Taylor-Winfield Special Four-Head Commutator Hot-Staking machine, 20 kva.

Circle 663 on Inquiry Form, page 119, for more data

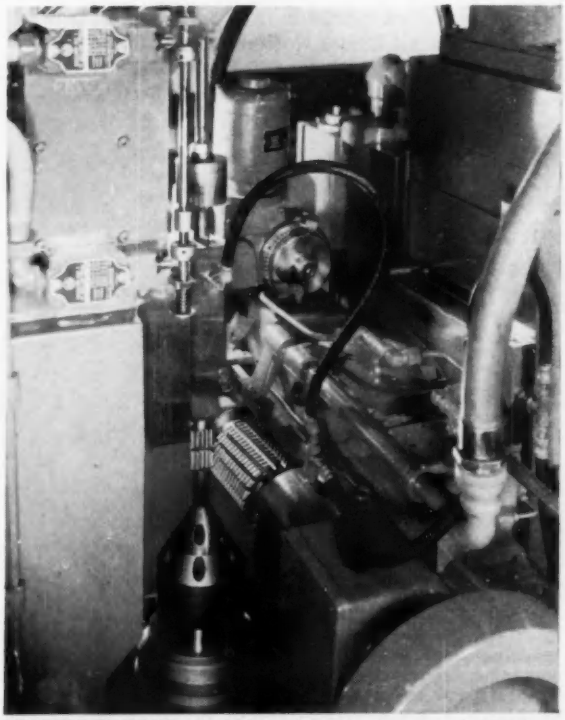
DISTRIBUTOR SHAFT BEARINGS — Grinding OD. Added efficiency 30 per cent over prior practice. Machine is equipped with automatic work loader complete with feeder magazine, rotary carrier, loading ram, and discharge chute. Loading and wheel dressing are integrated with grinding cycle. Landis Tool Co. Type H Chucking grinder.

Circle 664 on Inquiry Form, page 119, for more data



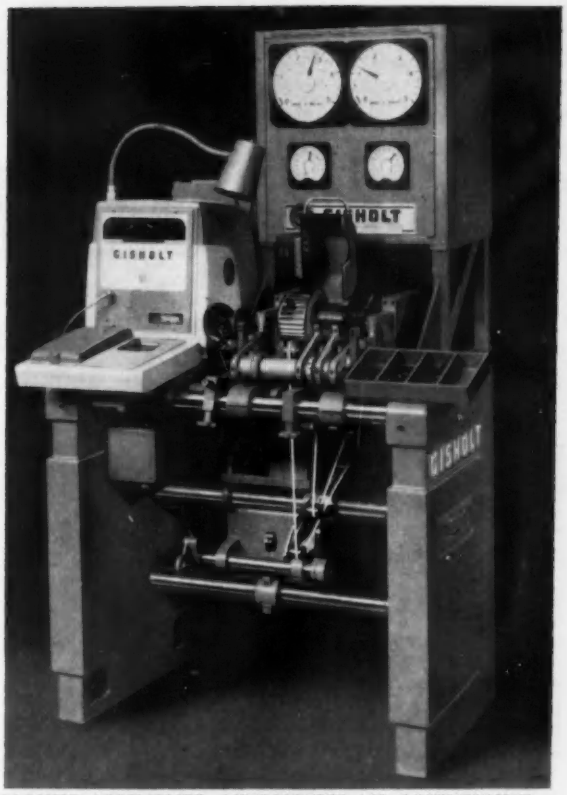
DISTRIBUTION BASES—Turning and boring, and pressing-in a bronze bushing. Automatic cycle. Turning and boring operations are held to 0.001 in. tolerance. Manually-loaded bushing conveyor is at top of machine. Warner & Swasey M-2540 6-in. 5-Spindle Chucking Automatic.

Circle 666 on Inquiry Form, page 119, for more data



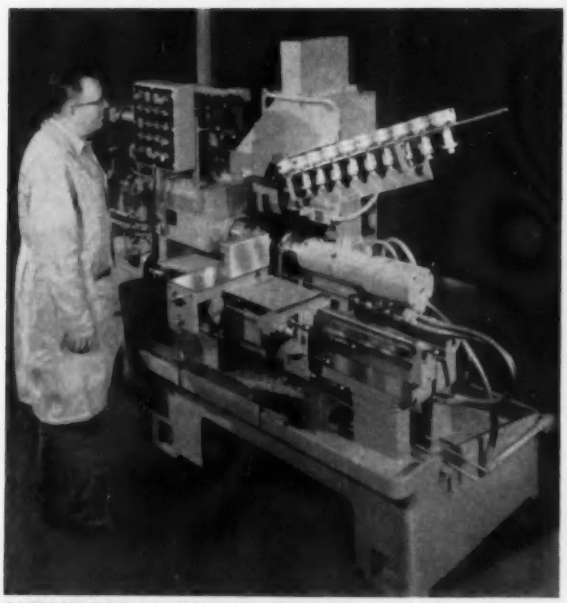
STARTER PINIONS—Hobbing of teeth. Increase in production 100 per cent. Barber-Colman No. 4-6 Vertical Hobbing machine, with automatic loading.

Circle 667 on Inquiry Form, page 119, for more data



BLOWER ASSEMBLIES, AUTOMOTIVE AIR CONDITIONER—Balancing, and inspection of balance. Output 74 assemblies per hour. Tolerance 1/64 oz-in. Machine indicates location and amount of unbalance in each plane. Aluminum clips (various weights in tray) are crimped to vanes by operator at indicated angles in each plane. Starting and stopping of work rotation is automatic, by raising and lowering protective shroud. Gisholt 1S Balancing machine.

Circle 668 on Inquiry Form, page 119, for more data



DISTRIBUTOR HOUSINGS—Turning and facing. Production approximately 420 pieces per hour. Parts are die castings. Standard Sundstrand lathe equipped with automatic loading and ejection of workpieces.

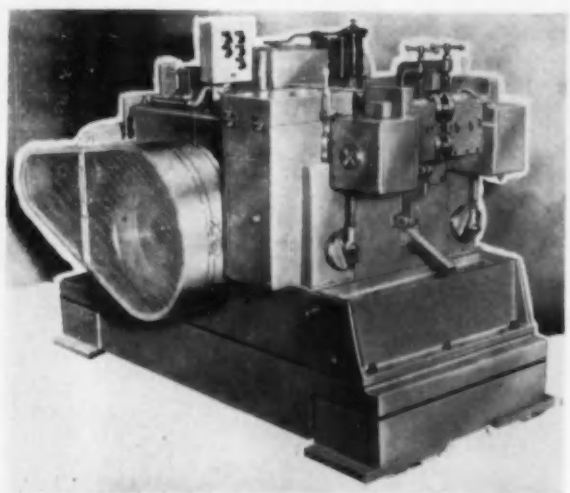
Circle 669 on Inquiry Form, page 119, for more data

Making "OTHER" Production PAY

General-purpose work, toolroom and experimental work, seals and gaskets, screws and studs, instrument bearings, speedometer shafts, miscellaneous.

TOOLROOM WORK—Precision milling, drilling, and boring operations on components of machine tools and fixtures. New machine installation in Main Tool Room of Oldsmobile Div., GMC. Electronically-controlled positioning at subsequent machining operation can be preset by operator during a machining cycle, thereby reducing setup time. Location to within 0.0001 in. is obtained without several manual setups previously needed to obtain comparable accuracy. A typical application, such as in-line boring of a multiple-spindle gear case, may now be done with only one manual setup by rotating work table up to 180 deg and utilizing electronically-controlled positioning. Oldsmobile is realizing superior quality of work, with a reduction in machining time of about 50 per cent on such applications. DeVlieg SPIRAMATIC JIG-MIL.

Circle 676 on Inquiry Form, page 119, for more data



BALL BEARING BALLS—Cold-heading blanks. Production increase 245 per cent over Model 7572 Hi-Pro ball header. Waterbury Farrel Model 5/16 High-Speed Ball Cold Header. Circular 951-A.

Circle 677 on Inquiry Form, page 119, for more data

SELF-TAPPING SCREWS—Slotting heads. Production increase 360 per cent over automatic screw head slotter. Screws up to No. 8 x ¾-in. shank length, and other similar fasteners. Waterbury Farrel Model 5 Slotter. Circular 948-A.

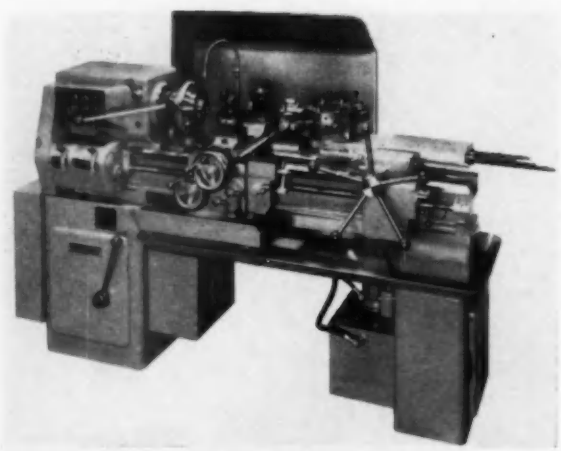
Circle 670 on Inquiry Form, page 119, for more data

SELF-TAPPING SCREWS—Rolling threads. Production increase 360 per cent over flat-die thread-rolling machine. Screws up to No. 8 x ¾-in. shank length, and other similar fasteners. Waterbury Farrel Model 10 Rotary Die Threader. Circular 949-A.

Circle 671 on Inquiry Form, page 119, for more data

HEADLESS STUDS—Rolling threads. Production increase 250 per cent over horizontal hand-feed thread-rolling machine. Headless studs up to ¼-in. x 2-in.-length of thread, by 3-in. max length. Waterbury Farrel Model 10 Horizontal Thread Roller with vibratory feed.

Circle 672 on Inquiry Form, page 119, for more data

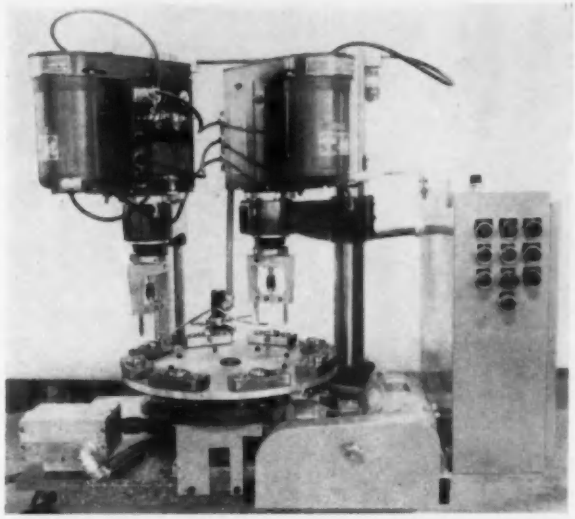


GENERAL-PURPOSE WORK—Lathe operations. New machine is equipped for turning between centers and for single-point threading, in addition to standard turret operations. Bar capacity is 1½ in., swing over bedways is 15 in. and swing over cross-slide is 8 in. Ram turret as six working stations. Turret is equipped with power feed box, pushbutton-controlled. Sixteen spindle speeds from 22 to 1250 rpm; optionally from 32 to 1800 rpm. Sheldon 3R Universal Ram-Type Turret Lathe.

Circle 678 on Inquiry Form, page 119, for more data

INNER BEARING RACES, INSTRUMENT — Grinding sides parallel. Production 5000 to 6000 per hour. Stock removal 0.006 to 0.008 in. Parallelism 0.000025 in.; uniformity 0.000075 in. Gardner Model 2H10 Rotary Carrier Double Disk grinder. Catalog D-60.

Circle 679 on Inquiry Form, page 119, for more data



SPEEDOMETER SHAFTS—Sweeping and drilling of jewels. Production 2000 parts per hour. For each cycle, operator places shaft assembly into a cammed open collet at front of machine. Top surface of jewel is automatically swept to remove any central burr, and then drilled concentric with shaft diameter within 0.002 in. tir. Gilman 8-station Dial Type Indexomatic machine.

Circle 680 on Inquiry Form, page 119, for more data

VARIOUS PARTS—Turning, facing, and boring. Numerically-controlled lathes with continuous-path two-axis control systems which combine linear and circular interpolation to define straight lines, slopes, and/or arc paths. Absolute accuracies of ±0.0005 in. and repeatability of ±0.0002 in. (static test). Nine sizes of machines. LeBlond Models 2013, 2516, and 2516-20 (up to 20 hp, 1500 rpm); Models 2516, 3220, and 3220-25 (up to 50 hp, 1510 rpm); and Models 4025, 4025-32, and 4025-36 (up to 75 hp, 650 rpm).

Circle 673 on Inquiry Form, page 119, for more data

DIES—Making by electrical discharge method. Added efficiency 25 to 40 per cent—often 100 per cent. Elox Machine.

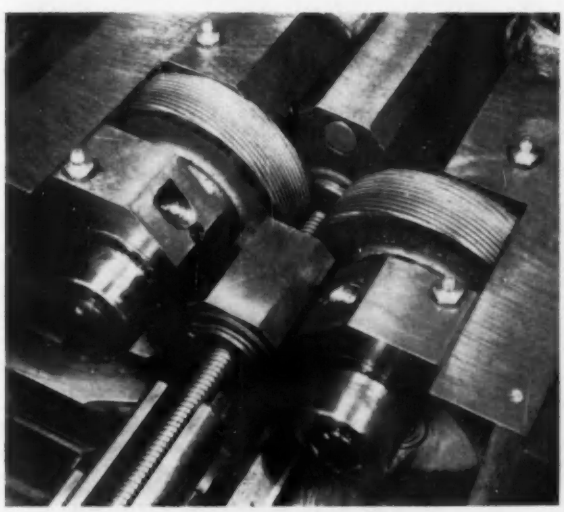
Circle 674 on Inquiry Form, page 119, for more data

SELF-TAPPING SCREWS—Cold-heading blanks. Production increase 300 per cent over Toggle cold header. Screws up to No. 8 x ¾-in. shank length, and other similar fasteners. Waterbury Farrel ⅛-in. Headmaster Cold Header. Circular 947-A-3.

Circle 675 on Inquiry Form, page 119, for more data

O-RINGS, GASKETS, ETC.—Mechanical impact removal of flash from molded rubber parts. On typical O-ring, direct labor savings amount to from 60 to 90 per cent. Precision molded parts are loaded into 2-cu-ft work chamber. Liquid CO_2 is sprayed through nozzles to freeze the flash without freezing the parts. While in this condition, the parts are rotated within blast of deflashing media. The impact of these particles fractures and removes brittle frozen flash, without damage to the resilient unfrozen parts. Wheelabrator Rubber Deflasher.

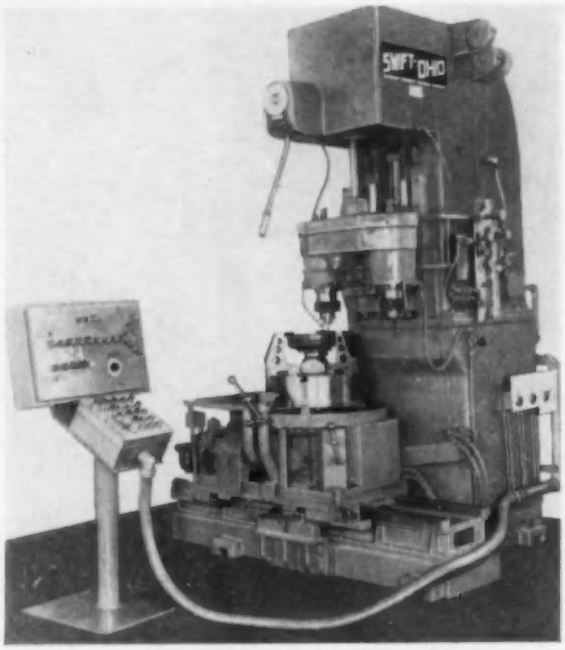
Circle 681 on Inquiry Form, page 119, for more data



JACK SCREWS—Thread rolling. Production 450 pieces per hour. Workpiece is 8¼ in. long, and of C-1018 cold-rolled steel. Thread is ½-in., 10-pitch, double lead stub Acme. Setup uses Infeed-Thrufeed rolling method. Landis Machine Co. 16LNR LAN-NU-ROL Thread Rolling and Forming machine.

Circle 682 on Inquiry Form, page 119, for more data

Making "OTHER" Production *PAY*



SHORT-RUN AND EXPERIMENTAL WORK—Drilling, boring, and tapping. Numerically-controlled machine. Electrical automatic cycling operation with complete unit positioning, and optional selective manual positioning. Swift Ohio No. 425 Upright Heavy-Duty Drilling machine with 24 x 36-in. compound table, hydraulic feed to spindle.

Circle 692 on Inquiry Form, page 119, for more data

SEAL RINGS, AIRCRAFT—Lapping. Efficiency 300 per cent compared to prior hand-lapping practice. Flatness within one light band (0.000011 in.) obtained. Taft-Peirce No. 9666 Semi-Automatic Rotary Lapping machine.

Circle 693 on Inquiry Form, page 119, for more data

TRANSMISSION CASES—Milling both sides. Production about 120 per hour. Motch & Merryweather Duplex-Type Index-Table Milling machine.

Circle 683 on Inquiry Form, page 119, for more data

TOOL-ROOM WORK AND OTHER PARTS—Drilling, boring, turning, and milling. Numerically-controlled machine with Warner & Swasey control. Example of savings on a Toggle Arm: Drilling, boring, turning and milling; 22 operations and using 11 tools; new time 42 minutes (with one jig) compared to old time of 125 minutes (with four jigs). Portage Horizontal Boring, Drilling and Milling machine.

Circle 684 on Inquiry Form, page 119, for more data

BEARING SEALS — Grinding. Production 1200 per hour. Seals are of rubber with raised metal ridges. Gardner Model IV18 Rotary Carrier Single Vertical Spindle Disk grinder.

Circle 685 on Inquiry Form, page 119, for more data

SETSCREWS, SOCKET HEAD—Thread grinding. Production 6000 screws per hour. Process changed from a cutting operation to a grinding operation. Thread is ¼ in., 20-pitch, UNC, Class 4, 5/16-in. long. Thru-feed method used, where a continuous stream of workpiece blanks are fed through the machine. Landis Machine Co. No. 1 Centerless Thread grinder.

Circle 686 on Inquiry Form, page 119, for more data

PIPE PLUGS, DRY SEAL—Thread rolling. Production 132 pieces per minute. Thread ¾ in., 14-pitch, NPTF. Completely automatic machine set up for continuous rolling. Landis Machine Co. 24PW LANHYROL Thread Rolling and Forming machine.

Circle 687 on Inquiry Form, page 119, for more data

TAPPET SCREWS—Thread rolling. Output of 30 million screws rolled without a complaint from customer. A 7/16-in. diam, 20-pitch, ⅞-in. long, 60 per cent "Lok-Thred" form thread is rolled to within 0.060 in. max of the shoulder, having a root diameter tolerance of 0.0015 in. Landis Machine Co. 18GA LANROLL Thread Rolling attachment.

Circle 688 on Inquiry Form, page 119, for more data

TIRE VALVE STEMS—Drilling, forming, and threading. Added efficiency 37 per cent over prior practice. National Acme Co. ¾-in. RA-8 Valve Stem machine with magazine feed.

Circle 689 on Inquiry Form, page 119, for more data

DIFFERENTIAL PINION SHAFTS — Drilling, chamfering, broaching flats, and cutting off. Production about 300 per hour. Motch & Merryweather Six-Station In-line Transfer machine.

Circle 690 on Inquiry Form, page 119, for more data

AXLE SHAFTS—Milling to length, centering to depth, and drilling drive holes. Production about 450 per hour. Motch & Merryweather Five-Station In-line Transfer-Type Milling and Centering machine with automatic load and unload.

Circle 691 on Inquiry Form, page 119, for more data

AXLE SHAFTS—Milling to length, centering to depth, and drilling two drive holes. Production about 210 per hour. Motch & Merryweather Four-Station Trunnion-Type Milling and Centering machine with self-centering, equalizing jaws, automatic load and unload.

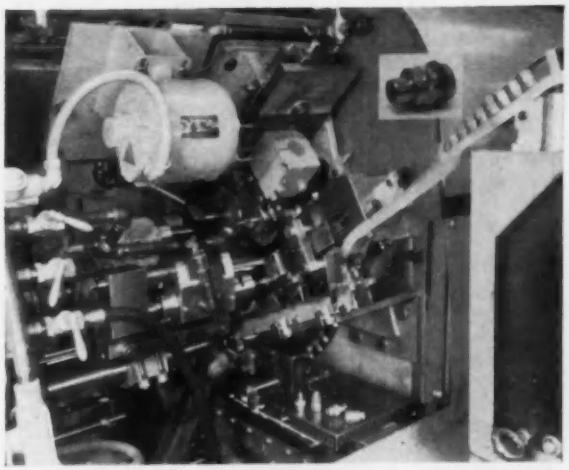
Circle 704 on Inquiry Form, page 119, for more data

MACHINE TOOL BOOKLET — New NMTBA eighteen-page booklet entitled "Machine Tools Today" describes many automotive operations. Write for your copy.

Circle 705 on Inquiry Form, page 119, for more data

TRACTOR LINKS—Drilling, boring, and reaming. Production 200 pieces per hour at 100 per cent efficiency; 160 pieces per hour at 80 per cent efficiency. Workpiece is a steel forging. Greenlee 7-station, Horizontal and Vertical Automatic Transfer machine.

Circle 706 on Inquiry Form, page 119, for more data



SPARK PLUG SHELLS—Turning, knurling, stenciling, and reaming. Added efficiency 25 per cent over 1¼-in. RA-6 bar machine. Original part made from bar stock; now a cold press forging. National Acme Co. 1¼-in. RA-6 Acme-Gridley Spark Plug Shell machine with magazine attachment.

Circle 707 on Inquiry Form, page 119, for more data

(Continued on next page)

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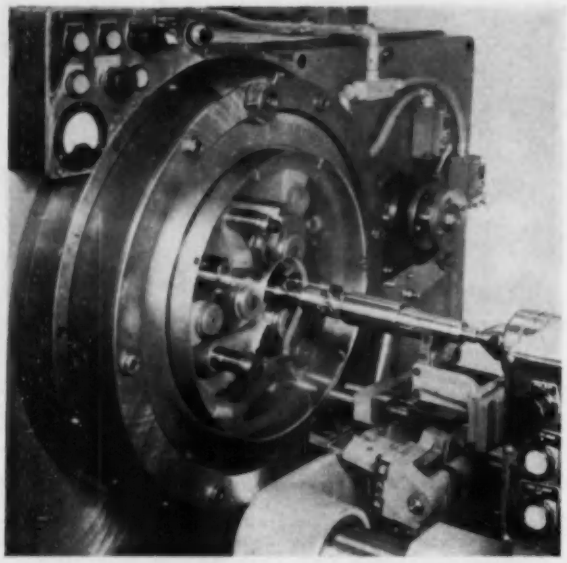
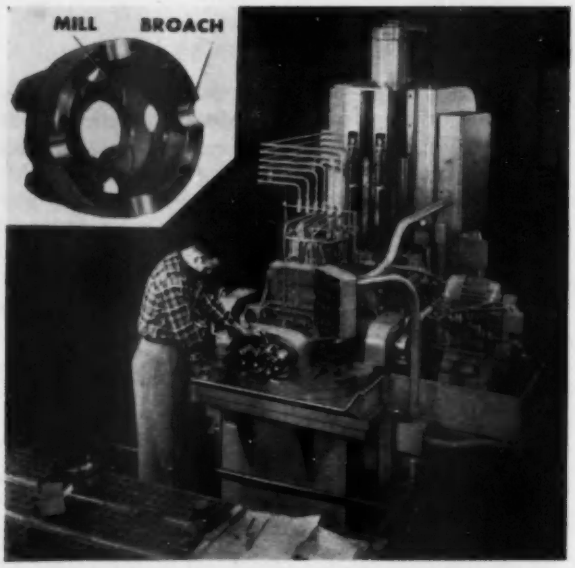
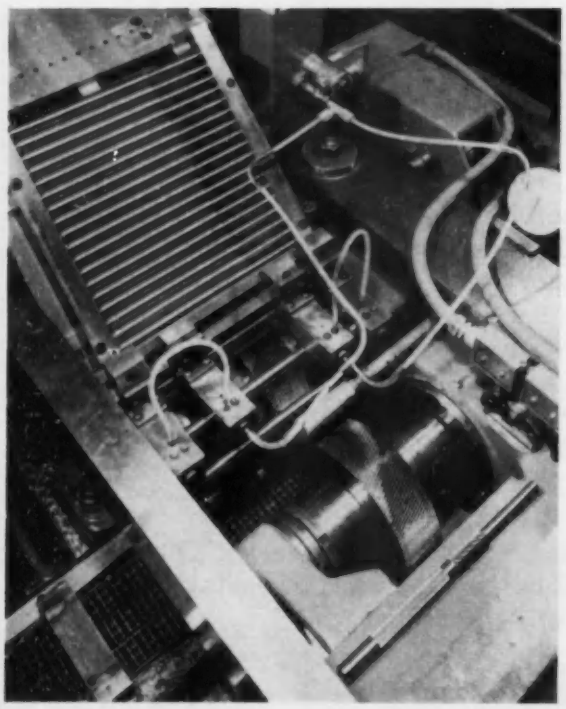


TRANSMISSION MAIN SHAFTS — Rolling of oil grooves. Approximately five times faster than previous milling method. Production rate is 4 to 6 pieces per minute. Reed Model A-23 Horizontal Three Cylindrical Die Type Thread Rolling machine.
Circle 701 on Inquiry Form, page 119, for more data



DIFFERENTIAL CASES — Broaching and milling. Workpieces are broached and milled on one automatic indexing machine, which reduced machining time about 70 per cent. The 4-station Sundstrand machine broaches four half-round slots and mills four oil grooves.
Circle 702 on Inquiry Form, page 119, for more data



STARTER ARMATURE SHAFTS—Spline rolling, and knurl rolling (two machines). Production 12 splines per minute; 27 knurls per minute. Workpiece is 11 in. long, and of C1144 steel. Involute spline is 0.625 P.D., 21.18 49/40 pitch, 12-tooth, 30-deg pressure angle, 25-deg right-hand helix angle, 13/16 in. long. Knurl is 0.633 to 0.638 in. diam, 0.040-in. pitch, 49-tooth, 90-deg straight knurl, 3¼ in. long. Both machines are completely automatic, incorporating the infeed rolling method. Landis Machine Co. 24PW LANHYROL Thread Rolling and Forming machines.
Circle 703 on Inquiry Form, page 119, for more data

DOOR HINGES—Drilling, reaming, and countersinking. Production rate 652 parts per hour at 100 per cent efficiency. Snyder Six-Station Rotary-Index Type machine.
Circle 708 on Inquiry Form, page 119, for more data

BRAKE DRUMS—Gaging. Inspection rate up to 250 parts per hour—9, 10, and 11-in. diam drums. Machine automatically checks ID on braking surface at two places, as well as concentricity. Colored lights indicate acceptable or reject dimensions. At the same time a recorder makes a printed record of dimensional quality. Machine also functionally checks size, depth, and runout of dust grooves on exterior of drum. Sheffield Brake Drum Gaging machine with pneumatic strip-chart recorder.
Circle 709 on Inquiry Form, page 119, for more data

SPEEDOMETER FRAMES — Drilling, chamfering, counterboring, reaming, tapping, and threading. Production 600 per hour, gross rate. Kingsbury Special machine with three verticlal and five horizontal machining units.
Circle 710 on Inquiry Form, page 119, for more data

AXLE SHAFTS—Rough and finish-turning flange faces, and burnishing oil seal diam. Total f-t-f time 1.05 minutes per shaft. Seneca Falls Model AR Lathe with special tooling.
Circle 711 on Inquiry Form, page 119, for more data

POWER LIFT HOUSINGS, TRACTOR—Drilling, chamfering, spotfacing, and forming valve seats. Production 32 pieces per hour. Lamb Special machine with one vertical and three horizontal way units.
Circle 712 on Inquiry Form, page 119, for more data
(*Turn to page* 120, *please*)

"MAKE *YOUR* PRODUCTION PAY"

NOW—a New Free Service for You

Machine Tool Equipment Planning and Data Service Available Only by Using This Page in This Issue to Request the Information You Need

For more information on equipment and machine tools described in *"Making Production Pay"* Section of this issue, circle corresponding numbers below, cut out inquiry form, fold on lines, seal with tape and mail. Form is self-addressed, post-paid.

A Special One-Time Self-Mailing Form

Use this handy inquiry form for additional data pertaining to the various machine tools and other production equipment described in this section.

Each item is keyed with a number. Circle the corresponding number on this form at the right, and your request for information will be forwarded to the particular manufacturers of the machines.

CUT OUT ALONG THIS LINE ► ► ►

Please send further information on items circled below.

301	302	303	304	305	306	307	308	309	310	311	312	313	314	315
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Your Comment on "Making Production Pay" Issue

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Send information to:

Name ..... Title .....

Company .....

Street .....

City ..... Zone ..... State .....

Making "OTHER" Production *PAY*

ROCKER ARMS—Grinding valve seat end. Production about 1200 per hour. Motch & Merryweather Three-Wheel Horizontal-Table Grinding machine with automatic wheel infeed, sizing, and fixtures.

Circle 694 on Inquiry Form, page 119

ROCKER ARM SHAFTS—Cutting off to length. Production about 300 per hour. Motch & Merryweather No. 00-A Machine with automatic stock loader, single bar.

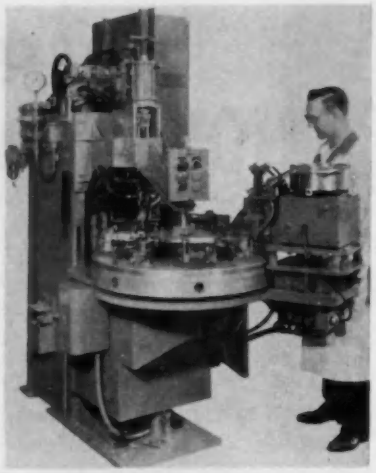
Circle 695 on Inquiry Form, page 119

VALVE TAPPETS — Grinding spherical radius on head. Production about 3600 per hour. Motch & Merryweather Four-Spindle Horizontal-Table Grinding machine with automatic loading and unloading.

Circle 696 on Inquiry Form, page 119

VALVE TAPPETS—Cutting off slugs for cold extrusion. Production about 540 per hour. Motch & Merryweather No. 0-4 Precision Automatic Sawing machine.

Circle 697 on Inquiry Form, page 119

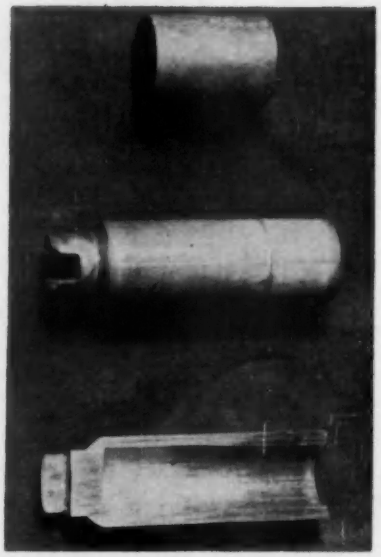


VOLTAGE REGULATORS — Welding studs to regulators. Studs are hopper-fed; regulators are manually placed in welding stations. Taylor-Winfield EN-LDD-12-50 Air-Operated Dual-Ram Seven-Station Dial-Feed Welder.

Circle 698 on Inquiry Form, page 119

ROCKER ARM SHAFTS—Cutting off to length, facing both ends, counterboring and chamfering both ends. Production about 200 per hour. Motch & Merryweather No. OT-3 Cut-Off and Double-End machine.

Circle 699 on Inquiry Form, page 119



WHEEL BRAKE PIVOT NUTS—Extruding. Production 60 pieces per minute, 3600 per hour. No material loss. Process is to shear and head SAE 1010 to 1013 hot-rolled steel (coil form), anneal, zinc phosphate lubricate, and extrude. Part is complete from one press unit, except for roll-threading. Verson Model 7B36 Extrusion Press, 215 tons, with dial-type tooling, hopper checking equipment.

Circle 700 on Inquiry Form, page 119

Circle 152 on Inquiry Card for more data ⟶

MAILING INSTRUCTIONS

Circle numbers on reverse side of this inquiry form for more information on machine tools and equipment described in "Making Production Pay" Section. Insert your name, title, company and address. Cut out and fold along dotted lines. Seal with tape and return to AUTOMOTIVE INDUSTRIES, postage free.

Your request will be forwarded to the manufacturer of the machine or equipment.

Fold on this line

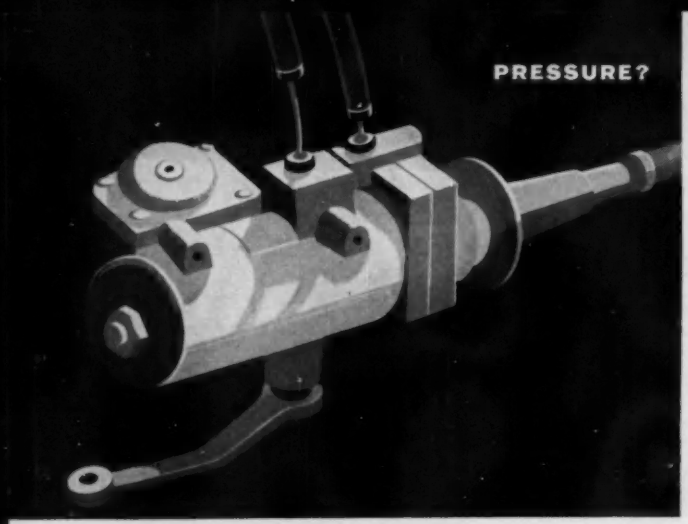
Fold on this line

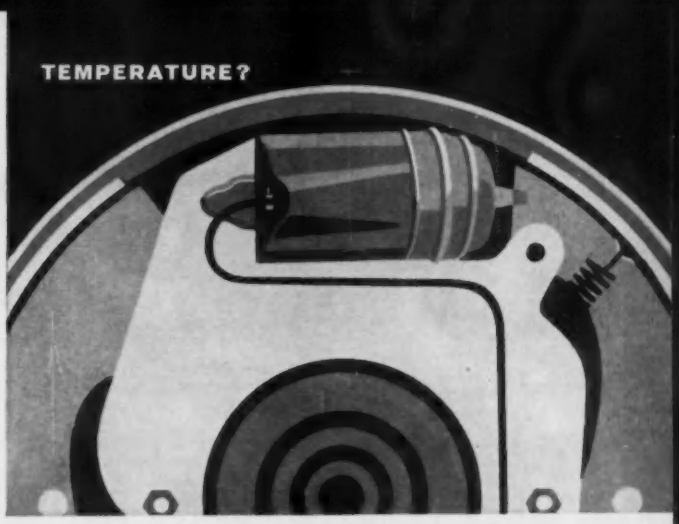
FIRST CLASS
Permit No. 36
New York, N. Y.

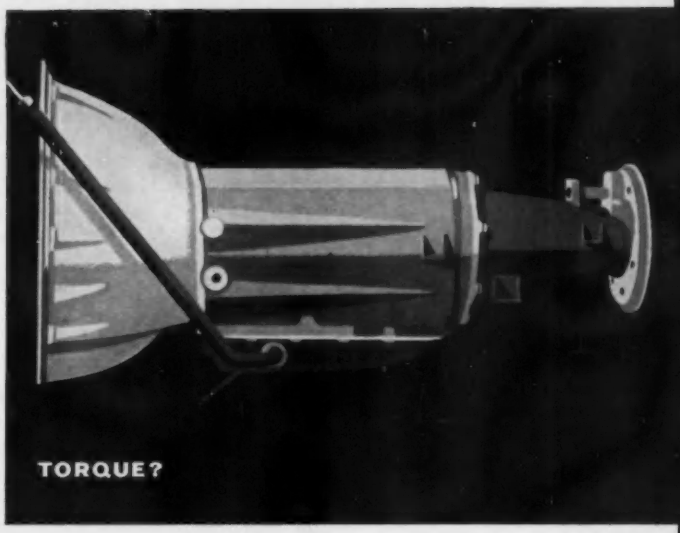
BUSINESS REPLY MAIL
No Postage Stamp Necessary if Mailed in the United States

POSTAGE WILL BE PAID BY

AUTOMOTIVE INDUSTRIES
P. O. Box 66, Village Station
New York 14, N. Y.







POWER PROBLEMS? . . . "tailored" hydraulic fluids meet new physical, chemical demands

New developments and designs in hydraulic systems frequently ask for fluid performances that aren't possible with present materials. And that's where the Dow Automotive Chemicals Laboratory can step in and "tailor" a fluid that will meet just about any physical or chemical need.

For many problems, a ready solution is frequently found by improving the existing formulation—for example, adding a thickener to alter viscosity characteristics. Other problems require a totally new material. Here's where the chemist has a special advantage—if he doesn't *have* the right fluid, he can *make* it! At the Dow Automotive Lab the chemists and automotive engineers are particularly well equipped to create new hydraulic fluids to extremely exacting specifications.

An example: a new Dow formulation was recently developed for a single central-power fluid to actuate steering, brakes, windows, and other accessories. To aid the Automotive Industry, the laboratory resources and experience are available to assist in particular problems.

With Dow's broad background in hydraulic fluid technology and a long list of glycols, Dowanol® glycol ethers, and other polyols, a ready answer to many hydraulic fluid needs may be achieved.

ENGINE COOLING. Ebullient cooling for passenger cars is under continuing research at the Dow Automotive Chemicals Laboratory. The increased flexibility of the system is expected to allow more freedom in the placement of radiators, for example, remote from their present location. This thought is intriguing to designers!

VORACEL® foamed-in-place, rigid urethane is showing real economic advantages over cut-and-paste batt applications. Application of the new water and chemical resistant foam may be either by a spray or pour operation for insulation, structural support, sound deadening, "pocket" sealing, and surface protection.

DOW AUTOMOTIVE CHEMICALS LABORATORY

Created expressly to serve the needs of the automotive industry, Dow's Automotive Chemicals Laboratory is active in technical service and development. This laboratory is continually researching and developing coolants, hydraulic fluids, cutting and grinding fluids, functional fluids, fuel and lubricant additives, and synthetic lubricants. To see how this laboratory can be of assistance to you, contact your nearest Dow sales office or write to Chemicals Merchandising in Midland.

THE DOW CHEMICAL COMPANY DOW Midland, Michigan

.0003″ SPHERICITY

from cold-headed to finished surface

. . . in just <u>two</u> operations

True sphericity, with closer control of size and surface finish than previously possible, is accomplished in only two cost-cutting operations by the new Micromatic process for machining truncated spheres.

The only machining operations on the spherical end are milling and Microhoning. Combining new techniques with specially developed spherical milling and Microhoning machines, the process generates sphericity within .0003″ tolerance and a controlled microinch finish of 6-10 rms. (Former methods were hard pressed to productively obtain sphericity within .002″.)

All the machining and polishing operations—such as turning, grinding, buffing—which old processing methods required on the spherical end are eliminated. Also, some operations on other parts of the workpiece (e.g., turning and grinding of the taper shank) are no longer necessary.

The new method can be applied to any truncated sphere which has a shank or bore to permit holding without touching the sphere. Micromatic will be happy to show you the dramatic savings being enjoyed by leading production plants using its spherical process.

Shown at left is a clutch release lever before and after spherical milling. In this case, accuracies and surface finish milled are perfectly satisfactory for assembly without further processing of the sphere.

MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT • DETROIT 38, MICHIGAN

Circle 153 on Inquiry Card for more data

NEW PRODUCTS AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

By C. J. Kelly
ASSISTANT EDITOR

Clip-On-Fastener

One piece self locking nuts have been designed to operate in temperatures up to 550 deg F, and can be used either as a fixed or floating anchor nut. The manufacturer reports this new fastener is suitable for numerous applications on sheet metal or fiberglass assemblies.

An important feature of the ESNA design is a locating eyelet formed on the base plate which snaps firmly

into the hole drilled or punched in the sheet. The shape of the eyelet and the spring tension of the clip design insure that the fastener will not shake loose from the assembly during transportation in the shop and prior to insertion of the screw. Type LHA4972 is manufactured from carbon steel; available inventory size 10-32, other sizes in design. Locking torque and tensile per MIL-N-25027. *Elastic Stop Nut Corp. of America.*

Circle 40 on Inquiry Card for more data

Metal-Filled Resins

Several new plastics products have been developed which show promise in answering many design problems at both high and low temperatures. These products are metal-filled resins.

The materials are basically rubber-like in character, due to the silicone resin structure which is present, plus the specifically selected metal fillers which impart unusual characteristics to the final product. This makes it possible for metal-filled, rubber-like plastics to be used at very low temperatures and very high temperatures in fulfilling the many design requirements of aircraft, electronics, missile, construction, nuclear radiation shielding and consumer products.

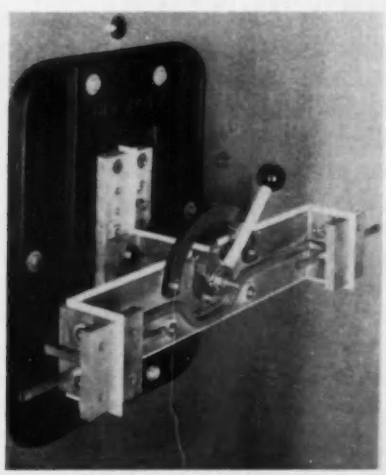
Among the products available are lead-filled silicones, bronze-filled silicones, steel-filled silicones, copper-filled silicones and aluminum-filled silicones, identified as Epocast H-1759 Systems. There are available rubber-like materials heavily filled with steel, bronze, or lead, for example, to extend the growing panorama of metal-filled plastics in many industrial and consumer applications. *Furane Plastics Inc.*

Circle 41 on Inquiry Card for more data

Transfer Switch

A transfer switch has been designed to enable a conventional single position generators to be utilized in a two position operation. Fixtures and work coils may remain set-up and ready for use while a second phase of an operation is being carried out. A two position table may be converted to a four position in the same manner.

This switch is massively constructed for maximum durability and

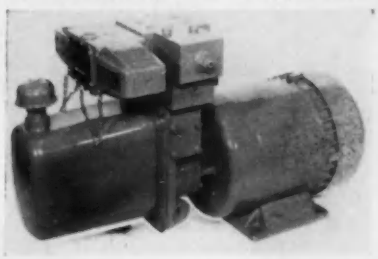


is safe for 100 pct duty cycle. There is little or no drop-off when this device is used with most work coils. *Induction Heating Corp.*

Circle 42 on Inquiry Card for more data

Power Packages

New motorized hydraulic power packages incorporate the pump, motor, valving and reservior in one compact assembly. This unit can be used in virtually any machine application.



In application, it is only necessary to bolt down the unit and connect the hydraulic lines to the actuator or actuators. The units are available in three different series. Two have an output of 8 gpm and one offers a 5 gpm output. *Vickers, Inc.*

Circle 43 on Inquiry Card for more data

Friction Material

A totally new organic friction material almost completely eliminates fading under high temperature applications, according to the manufacturer. With the new material, called J-M Style 160, positive control of brakes and clutches is possible at temperatures up to 1000 deg F, under conditions of high loads and fast cycling.

According to J-M, this high friction and high temperature resistant material is particularly suited to severe duty service. It exhibits an average coefficient of friction of 0.56 at 350 deg, 0.62 at 600 deg, and 0.53 at 1000 deg F, demonstrating unusual absence of friction fade. Rate of wear is well within the acceptable limits for materials of high friction level.

J-M Style 160 is a rigid, molded material, tan in color, and containing zinc particles. It is manufactured in blocks, facings, and sheets suitable for the majority of industrial applications. *Johns-Manville.*

Circle 44 on Inquiry Card for more data

(*Turn to page 125, please*)

IF YOU WANT TO MAKE IT LIGHTWEIGHT, YOU SHOULD KNOW ABOUT DYLITE®

Lightweight plastics are steadily becoming the automotive industry's most versatile engineering material. One of the most versatile of these plastics is DYLITE® expandable polystyrene. Tiny free-flowing beads are heated and expanded to form millions of cells that fuse together into a rigid foam plastic that has an amazing combination of properties. DYLITE is lightweight, strong, easy-to-mold, moisture-resistant, chemically inert, and low-cost. It makes a smooth, closed cell structure that can be molded in almost any size, shape or color. □ Here are some typical properties of DYLITE at the density of 2 lb./cu. ft. It has a Compressive Strength of 30 psi and a Tensile Strength of 50 psi. DYLITE is lighter than cork—it can be molded in densities of 1 to 10 lb./cu. ft. DYLITE possesses an Energy Absorption ratio (Maximum Load) of 56.74 in. lbs./cu. in. Its rate of Water Vapor Transmission is 1.18 perms, and its rate of Water Absorption is 0.9% by volume after 48 hours immersion. The Thermal Conductivity (K Factor) of DYLITE is 0.242 at a 75°F mean temperature. □ Contact Koppers if you want to work closely with a qualified staff of experts in plastics design and application. For complete technical information on DYLITE, write or call our Detroit Sales Office: 301 W. Eight Mile Road, Detroit 3, Michigan. Telephone: FOrest 6-5200. □ Koppers also makes these other fine plastics: DYLENE® polystyrene, DYLAN® polyethylene, and SUPER DYLAN® high-density polyethylene.

KOPPERS PLASTICS

NEW PRODUCTS

Auxiliary Governor System

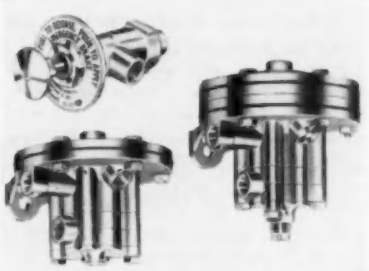
An auxiliary governor system has been designed to control the speed of power equipment with a wide variation in load requirements. This new

control will automatically adjust power supply to keep power take off speed constant. The governor will provide positive protection for hydraulic pumps, and lower maintenance costs.

Although originally designed for hydraulic applications, this new unit can also be utilized to control the speed of any hydraulic or mechanical devices powered by gasoline engines. *Holley Carburetor Co.*

Circle 45 on Inquiry Card for more data

Air Brake Devices



Two years of concentrated testing and development have gone into the making of a new line of air brake devices for motor freight. The new devices reduce the lag time in transmission of the braking control signal from the truck to trailer. Williams Power Brake Equipment Co.

Circle 46 on Inquiry Card for more data

Low Pressure Filter

Low pressure filter assemblies have been designed for application on a broad variety of fluid systems requiring high flow, low pressure and dependable filtration.

Some typical applications for this filter series include hydraulic power systems, industrial air lines, diesel fuel systems, pneumatic systems and lubricating oil systems.

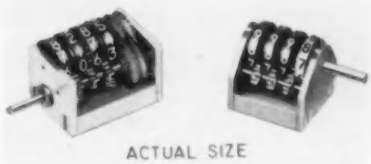
The new low pressure filter assembly series is rated at 150 psi operating pressure at 100F. Three different element materials are available with pore size ratings from two to 100 microns. These element materials include woven wire cloth Micromesh, sintered woven wire cloth Poromesh, and resin-impregnated cellulose fiber sheet Micropleat. All of these materials are pleated in element fabrication for maximum filtration area and dirt holding capacity. Called the Series 3500 filter, these assemblies are available in three sizes for three different flow ranges. These are nominally rated for MIL-H-5606 fluid at 30, 60 and 90 gpm. All three sizes

of the series use the same element, which conforms in size and configuration with Military Specification AN6236-3. To accommodate the different flow rate ranges, each of the three sizes is equipped with one, two or three elements depending on the flow rate. In the sizes using two and three elements, the elements are stacked concentrically in assemblies with correspondingly longer housings. *Bendix Filter Div., Bendix Corp.*

Circle 47 on Inquiry Card for more data

Sub-Miniature Counters

Models 1005 and 1006 are the smallest known sub-miniature counters on the market today, according to the manufacturers report. Drum



size is 0.288 in. in dia, and the digits are 0.075 in. high by 0.045 in. wide. The counter is reversible.

Model 1005 has a 200 to 1 gear reduction so that 20 revolutions of the input shaft equals 1 count on the units drum. The pitch of the gears in the train is 120. The package size is 7/16 in. wide by ⅝ in. long (not including shaft length) by 29/64 in. overall height. Maximum input speed is 5000 rpm.

Model 1006 package size is 7/16 in. wide by 15/32 in. long (not including shaft length) by 29/64 in. overall height. The frames are anodized aluminum, shafts are stainless steel and bearings are oilite. For military applications, the drums are anodized aluminum with engraved digits. *The Haydon Instrument Co.*

Circle 48 on Inquiry Card for more data

Urethane Packaging

A rigid urethane packaging material, named Hewfoam, provides a lightweight, moisture resistant, temperature insulating and shock-resistant package. Specifically intended for economical packaging and safe shipping of odd-shaped, fragile or expensive products, this material finds application in both large and small volume shipping. *H. E. Werner, Inc.*

Circle 49 on Inquiry Card for more data

Hydraulic Pump

Single acting hand operated hydraulic pumps, of near-aircraft quality, have been introduced in a new series. The new units feature easily

serviced externally removable poppet type check valves, and reversible hand sockets for vertical operation, or horizontal positioning where head space is limited.

The units are supplied with or without reservoirs for 1000, 2500 or 5000 psi operation with displacements of 0.9, 0.4 and 0.17 cu in. per stroke when force of 60 lb is applied to the 18 in. handle. A release valve is conveniently located in the front of the device. *The Sheffer Corp.*

Circle 50 on Inquiry Card for more data

(*Turn to page* 127, *please*)

←——Circle 154 on Inquiry Card for more data

ISOBRITE® 354 Zinc Plating Brightener

Unretouched photograph illustrates Isobrite 354's ability to give a sparkling finish to deep recesses and unusual shapes as well as flat surfaces.

Why does Isobrite 354 give you the most for your money? Let's see:

VERSATILITY—Isobrite 354 works at top efficiency over the lowest to highest current density ranges, giving you an extra bright finish in either rack or barrel operations.

ECONOMY—You get from 85,000 to 125,000 ampere/hours per gallon brightening life from Isobrite 354, depending on the degree of brightness you require. (And, if you're after a *permanent* full bright effect, use Iridite as a final finishing process.)

THROWING POWER—It's the ability to get into recesses—deep, narrow recesses—as well as giving a high luster on flat, easily accessible surfaces — that makes Isobrite 354 the right brightener for you. Flat, convex, concave surfaces—turns, twists or loops — Isobrite 354 covers any surface.

STABILITY—Isobrite 354 has exceptional high temperature stability . . . and it bounces right back to full effectiveness even after long, weekend shutdowns.

Call your Allied Field Engineer for complete information on Isobrite 354 or other Isobrite brighteners for zinc, cadmium and copper. He's listed in the Yellow Pages under "Plating Supplies". Or, write direct for technical data. On the West Coast, write or call the L. H. Butcher Co., licensee.

New Isobrite Pak with Flex-Spout gives pouring, storing and handling ease

Unscrew the cap and pop out the spout for non-drip pouring and accurate measuring. Pop the spout back in for safe, convenient handling. Spout, polyethylene container all packaged in a square, lightweight cardboard container to make storing and inventory easy.

FREE BOOKLET—"Practical Cyanide Zinc Plating". Gives practical information for purchasers and users of zinc plating processes. Tells how to produce quality work efficiently and economically. Direct requests to Department 2 of address below.

Allied Research Products, Inc.

4004-06 EAST MONUMENT STREET • BALTIMORE 5, MARYLAND

Affiliated operations in principal countries

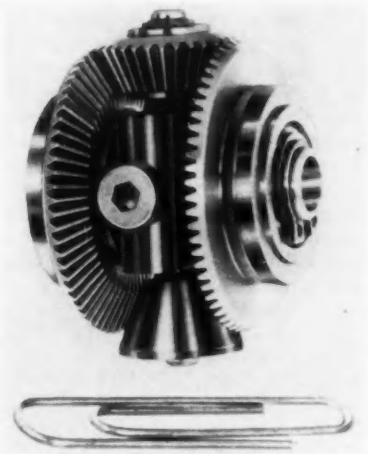
Circle 155 on Inquiry Card for more data

NEW PRODUCTS

Precision Differentials

A new line of precision hollow shaft differentials, designed especially for use in computers and control instruments where mounting requirements are restricted, has been announced.

Clearance circles down to 1 in. or less are provided by the new units, thus minimizing installation space.



Construction is entirely of stainless steel except where aluminum spider gears are specified. Each unit employs miniature ball bearings which conform to ABEC 7 tolerance requirements. Differentials are available with 0.1248, 0.1873, and 0.2498 in. bores in narrow and standard width (miter) designs.

Differentials are precision balanced and can be supplied with end gears made from flat blanks parallel within 0.0002 in. Pitch and number of teeth for end gears can be selected from a wide range to suit customer applications. Gears are mounted on differentials with true lock serration. *Instru-Lec Corp.*

Circle 51 on Inquiry Card for more data

Strapping Tape

A new vinyl-backed glass reinforced strapping tape offers good abrasion and weather resistance, along with high tensile strength. Called Dutch brand number 400, it is the only vinyl-backed strapping tape on the market, according to the manufacturer. The tape has an average tensile strength of 275 piw, and meets government specification PPP-T-97c, Type II. *Johns-Manville, Dutch Brand Div.*

Circle 52 on Inquiry Card for more data

Corrosion Inhibitor

An oil soluble corrosion inhibiting concentrate has been introduced for numerous applications in the protection of metal parts and products.

Called Nopcochex D, the product can be mixed with water, conventional oils or solvents to prepare many different types of rust preventives from the single concentrate. The various blends can be applied by brushing, dipping, spraying or slushing.

Nopcochex D is highly effective in the treatment of bar stock, sheet steel, tools, castings, assemblies and storage tanks, and in final tumbling operations of ferrous metal parts.

Depending on the concentration of a water blend, metal parts can be protected up to six months, and the preservative can be readily removed through the use of conventional degreasing solvents or alkali cleaners.

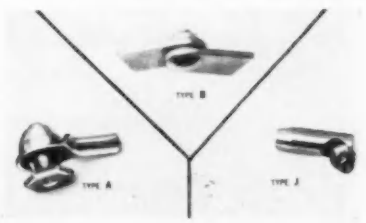
A water emulsion of Nopcochex D provides indoor protective qualities superior to those of many conventional oil-type rust preventives, with greater safety and economy.

A Nopcochex D water emulsion results in the concentrate particles being surrounded completely by water. The polarity of the rust preventive is such that the metal will attract the oil particles of the emulsion, while rejecting the water phase. *Industrial Div., Nopco Chemical Co.*

Circle 53 on Inquiry Card for more data

Linkage Ball Joints

Linkage ball joints and pivots have been introduced in a new line. The manufacturer reports the new line has been under development since 1954 and have conclusively demonstrated their ability to do a good job



in every conceivable application. There is a complete line available from miniature sizes for small instruments to giant sizes for heavy machinery and automobile steering joints and ball suspensions. All sizes and specifications for this line can be made to meet the users requirements. *Link-Age Corp.*

Circle 54 on Inquiry Card for more data

Cleanable Strainer

Flo-gard is the name given a new cleanable strainer. There are no nuts, bolts or screws used in the construction of the Flo-gard. The manufacturer recommends that when installing this device that it should be hand tightened.

Dupont corrosion-proof Delrin is employed in the end caps which are bonded by corrosion proof epoxy to monel screen and centertube.

The solid, full welded seam of the convoluted screen guarantees uniform filtration. Uniform strength is assured by continuous welding by heliarc of extra heavy gauge metal.

The Flo-Gard is versatile. It can be used either as a sump or in-line cleanable strainer on all types of lube oils, cutting oils, coolants, hydraulic oils, water, aqueous base and synthetics. *Industrial Filter Div., Warner Lewis Co.*

Circle 55 on Inquiry Card for more data

Temperature Sensing

Monitemp Mark III is the name of a new type of thermocouple. Features of the new device as reported by the manufacturer are high accuracy, small size and a money back guarantee.

The unit is equipped with a stainless steel retaining nut that is free from the thermocouple to permit installation and disassembly without twisting the stainless steel braided cable and the recording instruments. The cable is available to meet the length requirements of the purchaser. To insure compatability with recording instruments the cable is also available in chromel-alumel or iron-constantan. *Advanced Products Co.*

Circle 56 on Inquiry Card for more data

(*Turn to page* 150, *please*)

There's an R/M friction part in every make automatic transmission

. . . because only Raybestos-Manhattan makes all types of friction materials! For example:

- **Sintered metal plates**
- **Semi-metallic plates**
- **Cellulose plates**
- **Woven band lining**
- **Molded band lining**
- **Semi-metallic band lining**
- **Cellulose band lining**
- **Plastic friction dampeners**

What does this mean to you? It is your assurance of an unbiased recommendation of the material best for your application.

In addition, you can count on R/M for uniformly high quality; reliability of supply; prompt and extensive engineering, research and development assistance; competitive prices.

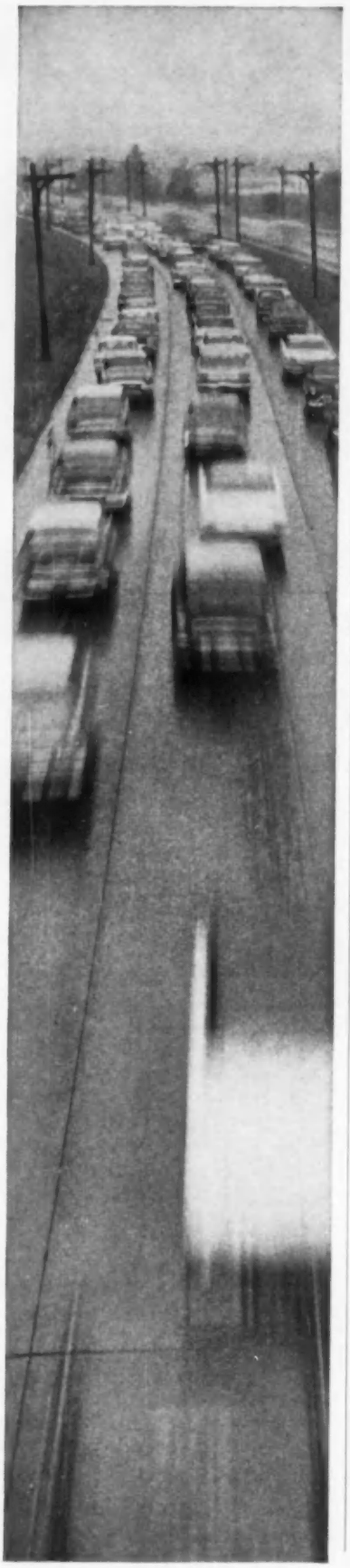
An R/M sales engineer can be at your desk within 24 hours if you will call or write. Meanwhile, why not send for our free bulletin of helpful engineering information on friction materials.

RM

RAYBESTOS-MANHATTAN, INC.

EQUIPMENT SALES DIVISION: Bridgeport, Conn.

Chicago 31 • Cleveland 16 • Detroit 2 • Los Angeles 58



Spending by U. S. companies this year for plant and equipment in foreign countries is expected to increase 20 per cent over 1960. The Commerce Dept. reports that expenditures by American firms in countries abroad will be $4.5 billion. In the U. S., the government expects plant and equipment expenditures to be about $34.5 billion in 1961, somewhat lower than 1960.

The U. S. may tighten restrictions on trade with Russia and its satellites. The Kennedy Administration is considering a switch in policy which could lead to stricter controls on shipments of American goods to Iron Curtain countries. Until now, the Administration has sought more trade with the Soviet bloc. But the Berlin crisis has changed leaders' minds.

President Kennedy's efforts to "protect the consumer" will have to be supported by existing government agencies. Plans for a special White House office or a Cabinet post have failed. Congress turned down bids for creation of a special consumer committee and for a Dept. of Consumers. The "protect the consumer" campaign will be carried on by the Federal Trade Commission.

A Federal crackdown on conflict-of-interest in government will influence the business world. Legislation will tighten rules covering the relationship of government employes with private companies. Penalties for conflict-of-interest violations will reach a maximum of a $10,000 fine, two years in prison, and forfeiture of private gains.

Several Congressmen are seeking a limit on wage increases. They say raises should be limited to 2 per cent, compared with the present average of 3 to 3½ per cent annually.

MANUFACTURERS' NEWS

Ford's Autolite Div.

Autolite has been chosen to replace Motorcraft as the name of Ford Motor Co.'s replacement parts marketing division, J. S. French, division general manager, has disclosed. Ford bought exclusive rights to the Autolite name in the U. S. along with other assets from the Electric Autolite Co. last April. The Autolite Div. is composed of separate sales departments responsible for marketing Ford products in the replacement parts field and as original equipment to manufacturers.

GM Diesel Ltd. Buses

General Motors Diesel, Ltd., will begin production of buses early this month at its London, Ont., plant, E. V. Rippingille, Jr., president and general manager, has announced. About 125 hourly rated employes will be used at the start of production.

Record Sales Reported

Sales for the fiscal year ended June 30 were the highest in Parker-Hannifin Corp.'s history, C. C. Sigmier, board chairman, and S. B. Taylor, president, told shareholders. Net earnings of $2.7 million on sales of $50.9 million, equal to $2.13 a share, compare with 1960 earnings of $2.8 million on $50.7 million sales, or $2.20 a share. Sales and earnings in the last nine months of the 1961 fiscal year exceeded those of the same period in 1960.

Motec Sales Up

Because of growing diversification, Motec Industries sales are 20 per cent ahead of last year, Edmund F. Buryan, president, reports. Diversification into materials handling equipment, construction equipment; automotive equipment, including engines, power trains and other products used by original equipment manufacturers; custom built forgings, gray iron castings and precision machine products have resulted in substantial sales increases, Mr. Buryan declared.

Lindberg Purchase

Lindberg Steel Treating Co., Inc., has acquired 100 per cent stock ownership of Lakeside Steel Improvement Co. The exact purchase price was not disclosed, but L. A. Lindberg, president of Lindberg Steel, said it was a cash transaction involving about $750,000. Lakeside Steel will continue to operate as a subsidiary and its operations will be headed by J. H. Ries, president.

Monroe Expansion

Monroe Auto Equipment Co. will double the size of its Cozad, Neb., plant, dedicated in June, and will enlarge its Hartwell, Ga., facility. W. D. McIntyre, executive vice president and general manager, said the expansion program will cost $1.5 million. Employment, presently at 250 in the Cozad plant, will be increased by another 225 persons when the addition is completed.

Goodyear Acquisition

Goodyear Tire & Rubber Co. has announced plans to acquire Geneva Metal Wheel Co., Geneva, O. The wheel company's assets will be purchased in exchange for an undisclosed number of Goodyear common shares. Geneva manufactures disc, spoke and cast wheels.

La Salle Quality Control

La Salle Steel Co. has announced completion of a new, centralized quality control laboratory at Hammond, Ind. The 4000-sq-ft structure contains modern quality control equipment, metallographic laboratory, and a complete machine shop.

Goodyear Spending

Goodyear Tire & Rubber Co. has announced a two-year, $180 million capital expenditure program—largest for any comparable period in the company's history. E. J. Thomas, chairman, said the huge sum would be spent in 1961 and 1962. Renewal tire sales in the last six months this year will surpass both the last six

(*Turn to page* 140, *please*)

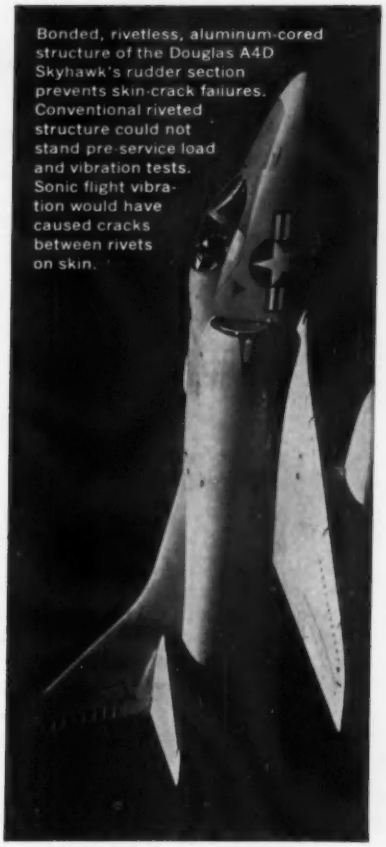

Bonded, rivetless, aluminum-cored structure of the Douglas A4D Skyhawk's rudder section prevents skin-crack failures. Conventional riveted structure could not stand pre-service load and vibration tests. Sonic flight vibration would have caused cracks between rivets on skin.

Photo courtesy Douglas Aircraft Company, Inc.

11 Ways Ray-BOND Adhesives Solve Tough Fastening Problems

New bonding and laminating techniques at R/M help solve difficult fastening problems and thereby make possible many of the new products being developed and produced by America's advancing technology. The advantages of Ray-BOND adhesives include:

Rivets can be eliminated • Members too thin to rivet can be joined and fixed • Manufacturing costs are reduced • Life of wearing surfaces is extended • Heat conductivity is improved • Weight reduction is substantial • Load is uniformly distributed over joint area • Bond produces residual elasticity • Complex shapes can be easily fabricated • Electrical non-conductivity and protection against corrosion can be achieved • Methods of application are fast, economical, flexible

Counsel and detailed technical information regarding the selection and application of adhesives are freely available to you from Raybestos-Manhattan. An R/M representative can call on you promptly to discuss your requirements.

MAIL COUPON FOR FREE BULLETIN

RM RAYBESTOS-MANHATTAN, INC.
Adhesives Dept., Bridgeport, Conn.

Please send me a free copy of your new technical Bulletin No. 701.

Name_____ Title_____

Firm_____

Address_____

City_____ State_____

Circle 157 on Inquiry Card for more data

For auto touch-ups and parts spraying...

New Hi-Volume POGO PUMP for auxiliary circulating systems

Binks new Pogo Hi-Volume pump is designed for use in either circulating or non-circulating painting systems. It is used as an auxiliary system in large automotive plants for special applications and as a principal source of supply in smaller systems.

Air operated with a 2 to 1 ratio, the new Pogo Hi-Volume pump is rated at 5 GPM and will supply several spray guns. Air consumption is 2 CFM per gallon. The pump's new air motor (double acting high speed poppet type air valve) makes it more durable and capable of trouble-free operation at rated output with free flow of material.

Four models of the new Pogo Hi-Volume are available. Three pump and container models to pump from 15, 30 or 55-gal. containers ("flip-top" access for filling and paint level inspection is provided by a hinged lid). Also available is a clamp or cover mounting model to pump from open top 55-gal. drums.

The new pumps may be used with or without a pump elevator, and a material agitator. An air regulator accurately controls pump delivery.

PLUS a "flip-top" lid for easy inspection, filling

Ask for Bulletin A41-27 for all the facts. Your Binks Representative has copies; or, write direct to the address below. No obligation.

Ask about our spray painting school. Open to all... NO TUITION... covers all phases.

Binks Manufacturing Company 3134 Carroll Avenue, Chicago 12, Ill.

REPRESENTATIVES IN PRINCIPAL U.S. & CANADIAN CITIES · SEE YOUR CLASSIFIED DIRECTORY

1348

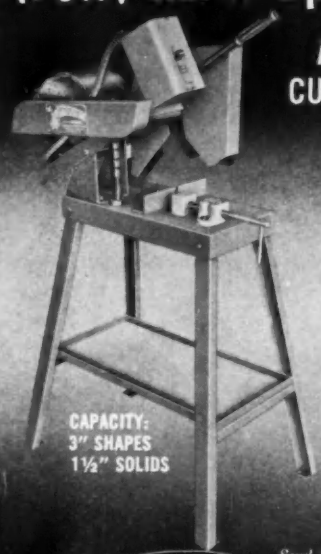
Binks Everything for spray painting

New! No. 11 Speed-Cut

A BUDGET-SIZE CUTOFF FOR EVERY SIZE SHOP!

FAST! POWERFUL! ECONOMICAL!

PRICED SO LOW YOU CAN'T AFFORD TO BE WITHOUT IT!



CAPACITY: 3" SHAPES 1½" SOLIDS

Speed-Cut Abrasive Cutting Machines

MANUAL OR POWER-OPERATED MODELS FOR WET, DRY, OR ANY-ANGLE CUTTING!

Speed-Cut

Send for complete catalog and name of nearest distributor

ABRASIVE MACHINE DIV.
BEAVER PIPE TOOLS, INC.
DANA AVE.
WARREN, OHIO

Circle 159 on Inquiry Card for more data

CUT BIG!
CUT FAST!
CUT SMOOTH!

CUTS LARGER SOLIDS

New "No. 20" Speed-Cut OSCILLATOR

THE ANSWER TO YOUR "TOUGH STUFF TO CUT" PROBLEMS

LEAVES "MACHINE TOOL" FINISH

IT OSCILLATES WHILE IT CUTS

Available on leasing or extended payment plan.

Speed-Cut
Abrasive Cutting Machines
MANUAL OR POWER-OPERATED MODELS FOR WET, DRY OR ANY-ANGLE CUTTING

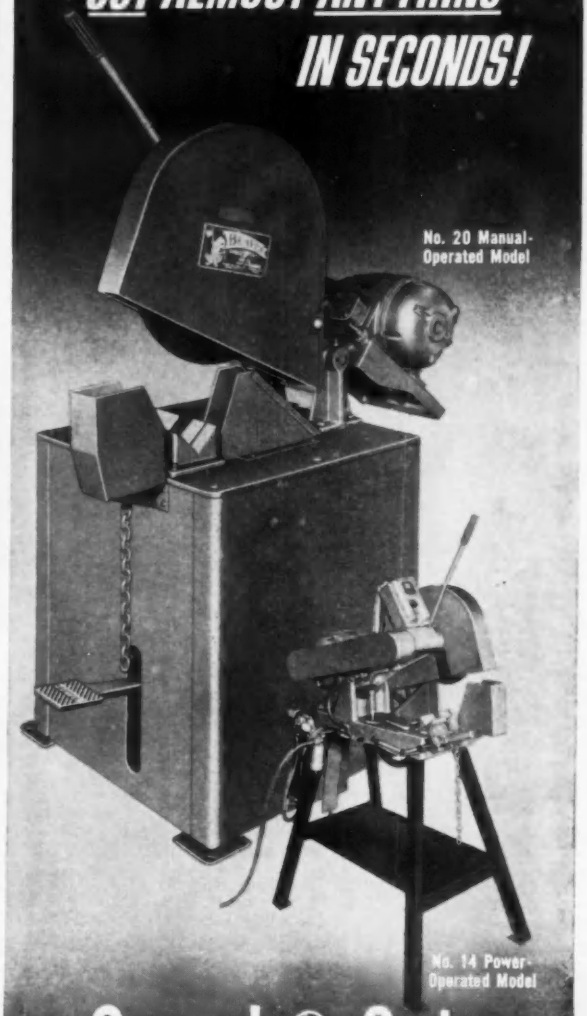
Speed-Cut

Send for complete catalog and name of nearest distributor

ABRASIVE MACHINE DIV.
BEAVER PIPE TOOLS, INC.
DANA AVE. WARREN, OHIO

Circle 160 on Inquiry Card for more data

CUT TIME! CUT COSTS!
CUT ALMOST ANYTHING IN SECONDS!



No. 20 Manual-Operated Model

No. 14 Power-Operated Model

Speed-Cut
Abrasive Cutting Machines
MANUAL OR POWER-OPERATED MODELS FOR WET, DRY OR ANY-ANGLE CUTTING!

Speed-Cut

Send for complete catalog and name of nearest distributor

ABRASIVE MACHINE DIV.
BEAVER PIPE TOOLS, INC.
DANA AVE.
WARREN, OHIO

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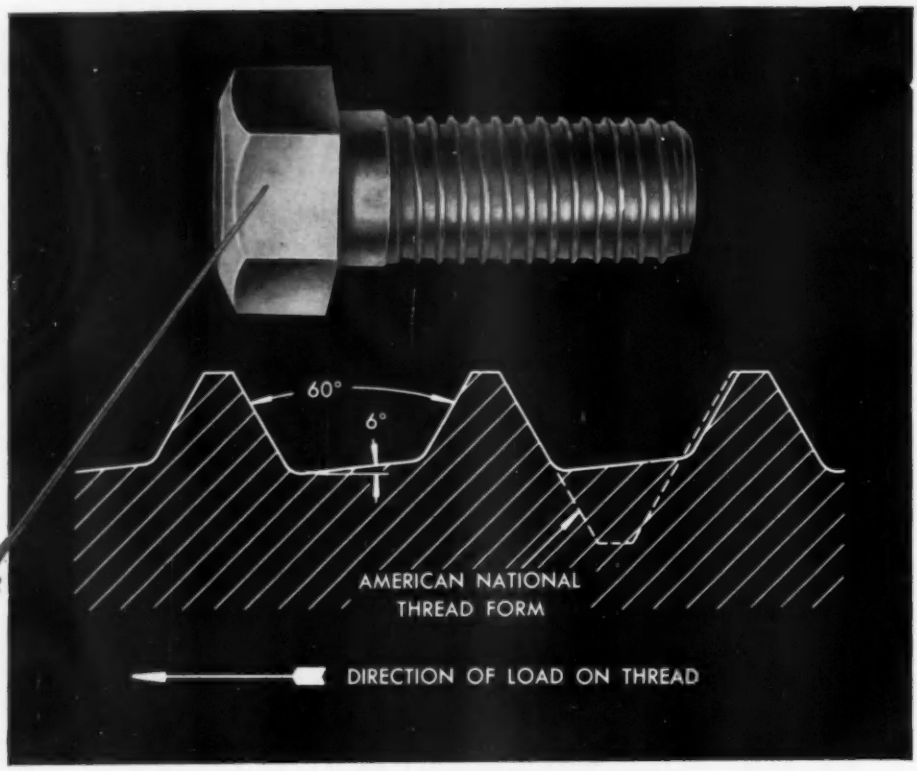
NAT'S quick facts about Fasteners...



Can **any** fastener actually **become tighter** in service?

WELL, HARDLY. NOT JUST *ANY* FASTENER...

But self-locking, extra-strength LOK-THRED® bolts, studs and screws *do*, and even after long service you can expect their breakaway removal torque to average about 70% higher than at installation.

Here's the reason. Just take a look at the LOK-THRED profile. Notice the extra-wide root? And its converging angle? It's held, strictly by design, to exactly 6 degrees.

Now, see what happens, as you drive any LOK-THRED fastener. It re-forms the metal of the receiving thread, squeezing out every void, and forming an intimate metal-to-metal contact. And each of the angled roots becomes a 6-degree tapered wedge, with the loading constantly pulling against it to make its anchorage even firmer.

That's why LOK-THRED fasteners actually *do* become tighter in service. They're self-sealing, too . . . fluids can't leak past them. And yet they're fully reusable . . . require no selective fits . . . can be used with ordinary tools.

Take our word for it, there are plenty of reasons* why LOK-THRED is superior for many kinds of fastening . . . and we'll be glad to help you develop any applications to your own products.

*They're all given in National's LOK-THRED booklet, with plenty of supporting data. Write for your copy.

National PRODUCTS

The National Screw & Mfg. Company • Cleveland 4, Ohio

California Division, The National Screw & Mfg. Company • 3423 South Garfield Avenue, Los Angeles 22, California

Circle 162 on Inquiry Card for more data

Heating and Ventilating Division

Durable, dependable, rugged. Evans heaters are *built for trucks!* They're tailored to truck manufacturer specifications. They're custom-engineered to provide the right BTU rating and proper heat distribution *for your specific truck models.* And they're designed for quick-and-easy maintenance.

Twenty-five years of engineering experience—plus rigorous tests and assembly-line inspections—go into the production of every Evans heater. This product quality has made Evans the largest manufacturer of heavy-duty truck heaters. And because of confidence in the quality of its products, Evans backs its heaters with a one-year/50,000-mile warranty.

Our engineers are ready to work with yours to design an Evans heater to meet your requirements. Write Evans Products Company, Dept. P-9, Plymouth, Mich.

Regional Representatives: Chicago, R. A. Lennox; Detroit, Chas. F. Murray Sales Co.; Allentown, Pa., P. R. Weidner.

EVANS PRODUCTS COMPANY
PLYMOUTH, MICHIGAN

Circle 163 on Inquiry Card for more data

Take a lead from the leaders...

Entire Plant Built Treating Processes at

"'Way Ahead"—in tilt-cabs, in off-the-highway heavy duty trucks, in custom features sums up Peterbilt performance. Adding more durability to these quality vehicles are Amchem chemicals for superior metal protection.

Around Amchem Metal Peterbilt Motors

Mr. Don F. Pennell, Peterbilt General Manager

"WITH ALODINE* AND GRANODINE** WE CLEAN, PREPARE AND PAINT MORE PARTS BETTER AND FASTER THAN WITH ANY OTHER PREVIOUS METHOD USED."

At Peterbilt Motors, Newark, California, a combination Alodine and Granodine dip system for both aluminum and steel cleaning and paint preparation has provided this major truck tractor manufacturer with production features which translate into end product advantages.

Peterbilt uses Alodine for pre-treating aluminum, finds it eliminates the need for prime coating parts, adds corrosion resistance and paint adhesion qualities, provides a clean welding surface so that no strength is lost. On steel, Granodine produces similar corrosion resistance and paint adhesion features; where steel is stored for several days, Granodine prevents oxidization, keeps the metal rust-free until use.

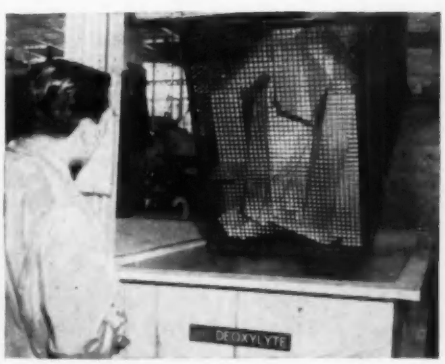
*Amchem's registered trademark for its conversion coating chemical for aluminum.

On the metal treating line Alodine and Granodine speed production, have cut time and labor by over 65 percent over previously used methods. Maintenance is nil, dip tanks have not been emptied or cleaned since mid-1960, yet chemical coating uniformity remains at peak high! Peterbilt personnel state for the record—"*As far as we are concerned the process is 100 percent perfect.*"

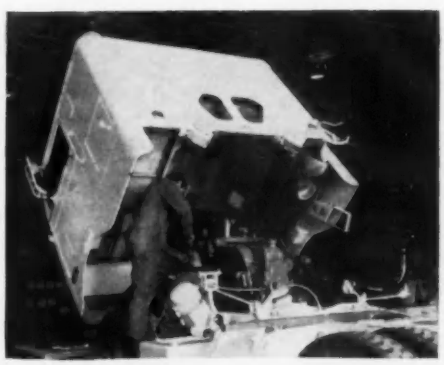
If you fabricate transportation equipment, consider the most efficient metal protection available for your product—an Amchem process and conversion coating chemical for virtually all production type metals. Consult your local Amchem Representative.

**Amchem's registered trademark for its conversion coating chemical used to produce phosphate coatings on steel.

Overall view of Amchem dip line. Both aluminum and steel can be treated interchangeably through in-line operation.



Baskets of parts coming out of final acidulated rinse are easily controlled by one man operating overhead trolley conveyor system.



Final in-plant inspection on tilt-cab truck. Vehicle receives final adjustment and rigorous road testing before shipment.

AMCHEM **AMCHEM PRODUCTS, INC.**

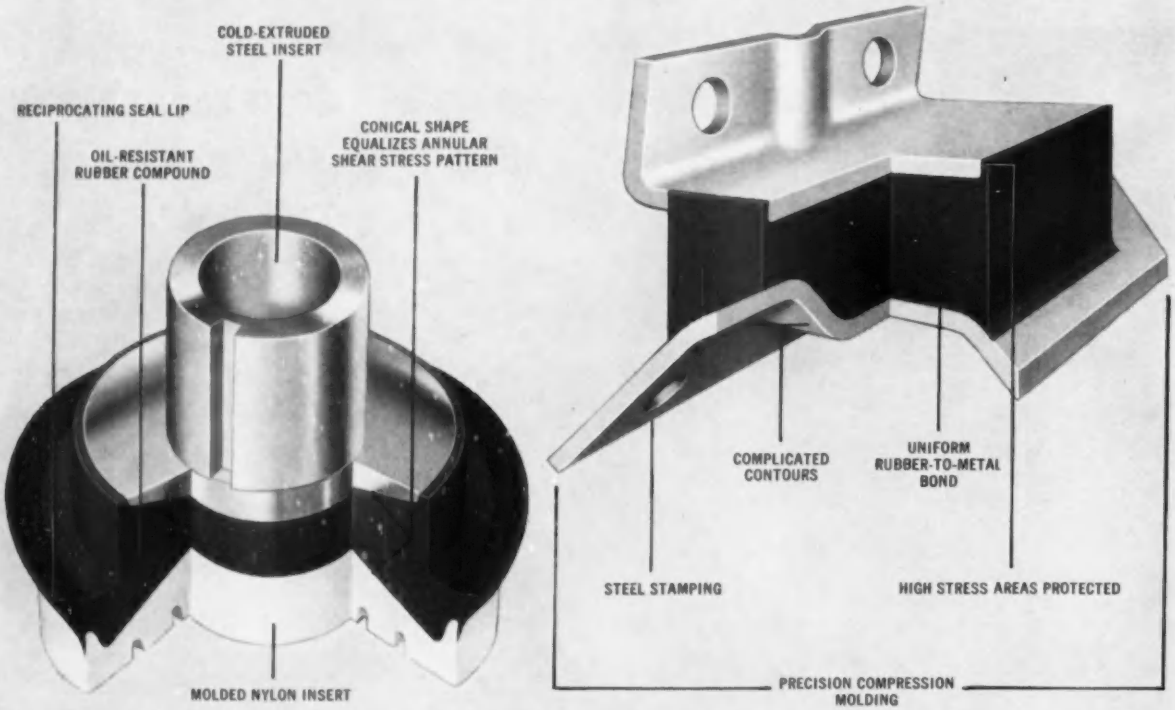
Amchem is a registered trademark of

AMCHEM PRODUCTS, INC. (Formerly American Chemical Paint Co.)

AMBLER, PA. • St. Joseph, Mo. • Niles, Calif. • Detroit, Mich. • Windsor, Ont.

OHIO RUBBER

"CUSTOMEERED COMPONENTS BASIC TO INDUSTRY"



FLEXIBLE COUPLING—"customeered" to a specific rate of torsional shear. **Problem Solved:** Bonding of tough rubber compound to greatly dissimilar materials—steel and nylon. Reliable manufacture in bulk by OHIO RUBBER called for special handling of materials, rigid temperature control, building and maintenance of custom-designed compression molds.

ENGINE MOUNT—designed for utmost reliability. **Problem Solved:** Specific rate requirements to very close, demanding tolerances. A good reliable bond had to be achieved despite the inherent complexity of molded shapes necessary. Part components and mating shapes required careful design, calling upon ORCO'S deep experience with materials other than rubber—a specific requirement for economical production.

How ORCO IDEA PARTS improve your product design

OHIO RUBBER IS YOUR GOOD SOURCE for quality rubber or rubber-like automotive parts. ORCO facilities (5 major plants) assure custom engineering, quality-controlled manufacture, reliable delivery and supply. Over 75 years of "CUSTOMEERING" qualifies OHIO RUBBER to serve you well. Call us, at no obligation, today!

Factories: Long Beach, Calif. • Fort Smith, Ark. • Willoughby, O. • Conneautville, Penn. • Stratford, Conn.

ORCO **THE OHIO RUBBER COMPANY**

General Office • WILLOUGHBY, OHIO • WHitehall 2-0500

A DIVISION OF THE EAGLE-PICHER COMPANY

FREE!

RUBBER DESIGN DATA

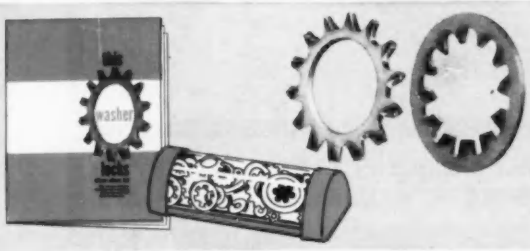
These comprehensive, factual manuals should be in your working library. Ask for Form 730 and "Orthane "bulletin.

AU-61

Circle 165 on Inquiry Card for more data

DON'T GAMBLE...with your product's reputation

INSIST ON GENUINE SHAKEPROOF® LIVE ACTION LOCK WASHERS!



Customer loyalty is not a matter of *luck!* It's based on your product's *reputation* for top quality, trouble-free performance! A good reputation depends on the quality of each component used in manufacture *and assembly.* Fasteners—lock washers in particular—carry a big part of this responsibility. Washers that don't measure up to the rest of your product can cause real trouble . . . can actually result in brand switching by your customers.

Don't Gamble! Don't settle for a lock washer that's "good enough." Look alikes don't act alike! Genuine Shakeproof Live Action Lock Washers bite on both sides . . . the only lock washers that lock right—stay tight—where others fail.

TEST THE BEST—FREE! Send for the free Shakeproof Live Action Sample Kit. Includes a wide selection of lock washers and the informative "This Washer Locks Where Others Fail" booklet.

T. M.

Look for this symbol when you buy or specify to be sure you are getting *Genuine* Shakeproof Live Action Lock Washers!

SHAKEPROOF
DIVISION ILLINOIS TOOL WORKS INC.
ST. CHARLES ROAD • ELGIN, ILLINOIS
IN CANADA: SHAKEPROOF/FASTEX,
DIVISION OF CANADA ILLINOIS TOOLS LTD.
67 Scarsdale Road, Don Mills, Ontario

Copyright Shakeproof, Division Illinois Tool Works Inc., 1961

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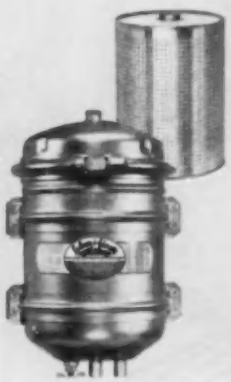
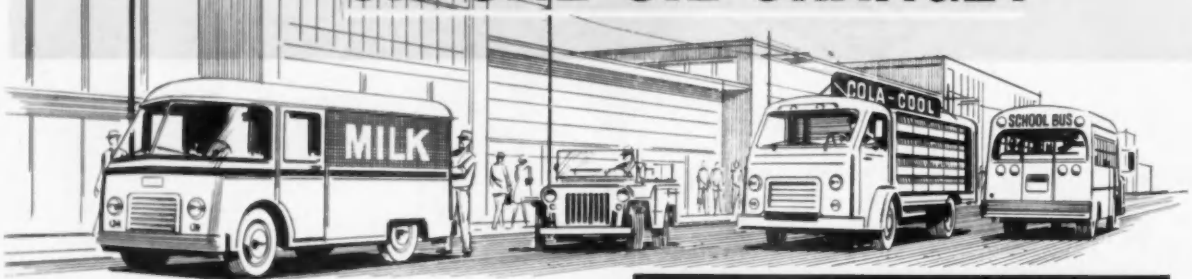


LUBER-FINER KEEPS H.D. DETERGENT OIL CLEAN through 10,000 to 15,000 miles of stop and go operation... ON ONE OIL CHANGE!



Fleet operation tests on all makes of trucks have proven that Luber-finer and DIESELPAK® extend oil change intervals by cleaning more detergent-type oil, cleaning it faster and keeping it clean longer—maintaining top lubricating effectiveness for 10,000 to 15,000 miles.

H.D. detergent-type oils *must* be kept clean to maintain lubricating qualities. Luber-finer's patented filtering process and exclusive media remove all impurities, maintain the oil's clarity and color—without removing or adversely affecting the additives. When you equip your fleet with Luber-finer, you know you have clean oil—even with stop and go driving!

Luber-finer pays for its entire installation with savings in only 8½ months. After that you keep the profit of over $50 per truck.* Check your operation with the Luber-finer comparison chart.

For complete information on "How to enjoy more miles of effective filtration... at less cost" contact your Luber-finer distributor or write direct.

PAYS FOR ITS ENTIRE INSTALLATION IN 8½ MONTHS*... AFTER THAT YOU KEEP THE PROFIT!

LUBER-FINER COST COMPARISON CHART

	WITHOUT LUBER-FINER	WITH LUBER-FINER
Miles per oil change	1,000	10,000-15,000
Oil changes per year	12	1
Oil used per year	72 qts.	9 qts. (with 272-C unit)
Cost of oil @ 20¢/qt.	$14.40	$1.80
Cost of labor @ $3/hr.	$36.00	$3.00
Cost of replacement packs	$10.80	$3.03
Cost per truck per year	$61.20	$7.83

YEARLY SAVINGS PER TRUCK EQUIPPED WITH LUBER-FINER $53.27

*BASED ON AVERAGE OPERATION

Luber-finer® INCORPORATED
2514 So. Grand Avenue Los Angeles 7, Calif.

APPROVED FOR INSTALLATION ON
Dodge... G.M.C.... Chevrolet... Divco... Reo... Diamond T... and other leading trucks.

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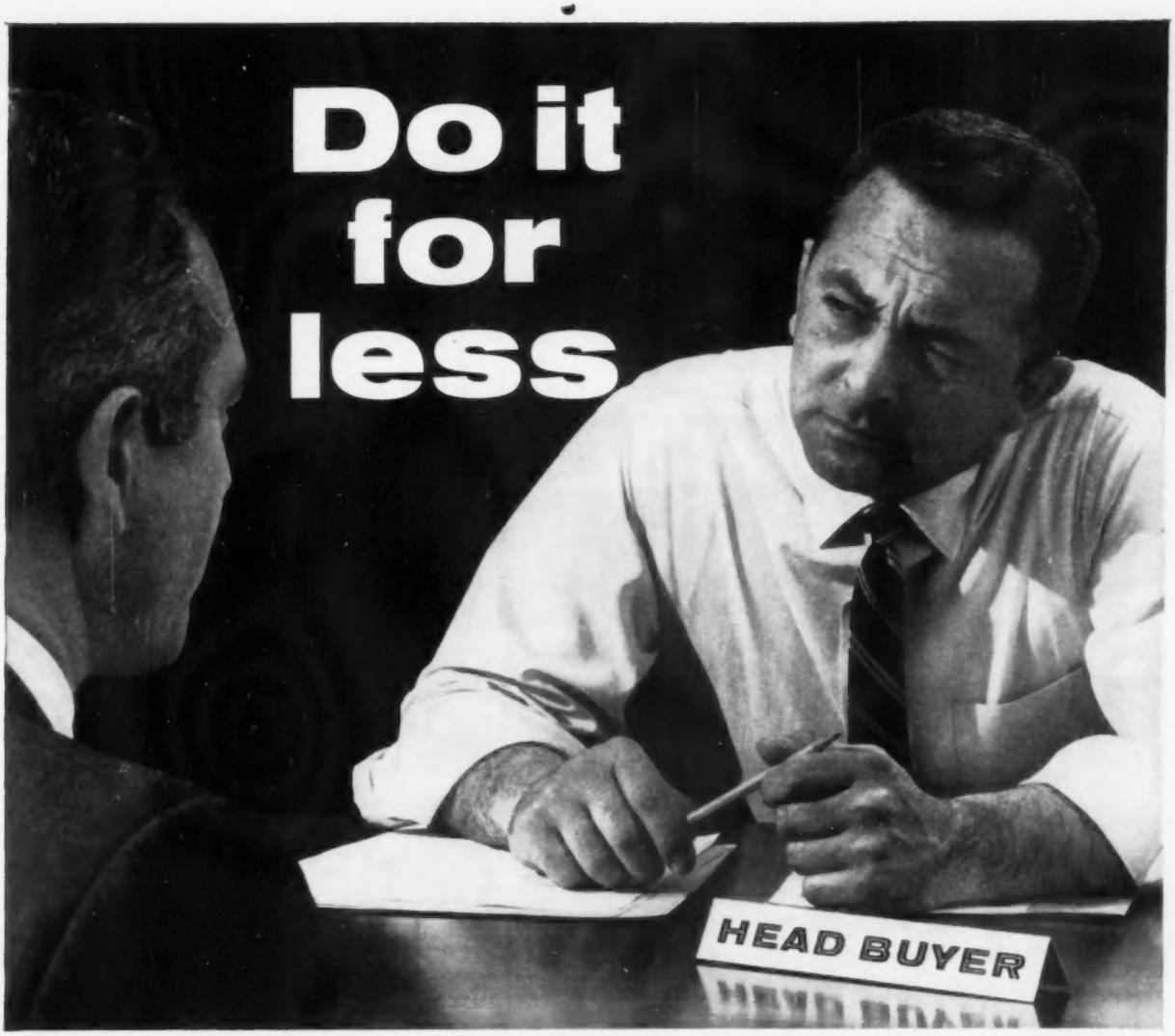


ON A CRI-DAN AUTOMATIC THREADING LATHE

Gisholt CRI-DAN Model B Automatic Threading Lathe

Sets up in 8-15 minutes for maximum profits on job lots or long runs.

Produces single- or multiple-start, standard or special form, left- or right-hand, straight or tapered, internal or external threads right up to shoulders, in a matter of seconds.

Can combine threading with tracing and other machining during the automatic cycle.

Provides top quality and fine finish in any material in a fraction of the time and/or cost required by milling, grinding, or special taps and dies.

Buyers can't afford to pass up a sales approach based on equipment that cuts threading costs 30-80%.

This advantage is attained with the Gisholt Cri-Dan Threading Method—that uses an inexpensive, single-point, carbide tool to cut *quality* threads in *any* material —*automatically!* Now, you can set up in 8-15 minutes and produce *any* type of thread in a matter of seconds. Accessories combine tracing and standard machining with threading for added savings. If you want to thread for less, *call your Gisholt Representative or write for Catalog 1215.*

GISHOLT
MACHINE COMPANY
Madison 10, Wisconsin, U. S. A.

Turret Lathes • Automatic Lathes • Balancers • Superfinishers® • Threading Lathes • Factory-Rebuilt Machines with New-Machine Guarantee

IT'LL PERFORM BETTER IF IT'S *NYLAFLOW*® CODED!

NYLAFLOW PRESSURE HOSE
Special polyamide innertube
Braided hi-tensile nylon bonded to innercore
Abrasion resistant nylon cover
NYLAFLOW FREON HOSE
NYLAFLOW ANHYDROUS AMMONIA HOSE-4000 PSI BURST

■ Every foot of job-matched NYLAFLOW Pressure Hose is distinctly trademark-coded for quick identification of your "improvement in hose performance." Why engineer costly, bulky hose assemblies when there's a NYLAFLOW answer to your problem?

Highly resistant to flex and vibrational fatigue, NYLAFLOW is available in long, continuous lengths with burst pressure ratings from 4,000 to 12,000 psi. Inside diameters range up to ¾" and over with compact, lightweight assemblies if desired. Reusable or permanent fittings are available.

TYPICAL APPLICATIONS

1. Hydraulic, high pressure lube and pneumatic lines. NYLAFLOW is unaffected by both flammable and non-flammable hydraulic fluids.
2. Freon lines—NYLAFLOW has a remarkably low effusion rate for refrigeration and air conditioning products.
3. Solvent or hot paint lines of NYLAFLOW are unaffected by almost all organic solvents.
4. Anhydrous ammonia lines last indefinitely—when NYLAFLOW hose is used.
5. Pressure lines where electrical insulation is required.

Write today for details and illustrated brochure.

POLYPENCO®

THE POLYMER CORPORATION OF PENNA.
Reading, Pa.

Engineered Industrial Plastics

MANUFACTURERS' NEWS

(*Continued from page* 129)

months of 1960 and the first six months of 1961, Mr. Thomas said. He added that all the firm's foreign plants are running at capacity and should continue at capacity for at least six months.

Autolite in Mexico

Electric Autolite Co., along with Productos Para Industrias and a group of Mexican investors have announced formation of a new firm to manufacture a complete line of automotive electrical equipment in Mexico. The new line will be marketed under the brand name Prestolite. The new concern will be known as Industria Electrica Automotriz, S. A. and will be located in or near Mexico City.

New Grinding Standard

The Grinding Wheel Institute has announced the availability of a new American standard entitled "American Standard Specifications for Shapes and Sizes of Diamond Grinding Wheels, Hand Hones and Mounted Wheels." It contains 37 pages of information on standard shapes and sizes of diamond grinding wheels. A shape and size of a diamond grinding wheel has been included in this standard only after determining on the basis of sound engineering practice, whether or not it was designed, dimensionally, to perform the job for which it was intended.

ASF Doubles Income

American Steel Foundries has reported net income for the quarter ended June 30 was more than double the previous quarter results, but fell below the year earlier levels. Earnings in the nine months ended June 30 also were less than the year ago pe-

(*Turn to page* 146, *please*)

ALEMITE BARREL-TO-BEARING LUBRICATION...

product and profit boosting production tool

Lubrication is a vital production tool—proven as the means to step up production . . . cut downtime . . . increase machine life and efficiency! A lubrication system should be as carefully selected as any other major production tool in your plant. Investigation will show that the finest plan is Alemite Barrel-to-Bearing Lubrication.

Every day, more and more profit-minded plant men place their trust in Alemite Barrel-to-Bearing Lubrication. With either electric, air or hand operated equipment, it provides the cleanest, fastest, most efficient transfer of lubricant from refinery barrel to your machinery's bearings. It can fill your plant's needs for high pressure lubrication, servicing oil reservoirs, filling gear housings, and refilling grease guns.

A letter or phone call will bring an Alemite specialist with a plan to boost your profits with the most efficient lubrication system yet developed. Or write for a free Alemite Catalog today!

Symbol of SW Excellence

ALEMITE DIVISION **STEWART-WARNER** CORPORATION

Dept. M-91, 1850 Diversey Parkway, Chicago 14, Illinois
In Canada: Stewart-Warner Corporation of Canada, Ltd. Belleville, Ontario

Barrel pump is inserted into a fresh drum of lubricant.

Pump supplies lubricant under pressure through pipes to all outlets.

Operator hooks onto spaced pipe outlet applying lubricant where needed.

INDUSTRIAL DISTRIBUTORS THE RIGHT HAND OF PRODUCTION

Circle 170 on Inquiry Card for more data

AIRBRIEFS

By R. Raymond Kay
PACIFIC COAST EDITOR

How to stem the Communist threat to world peace?

One answer: pour more and more billions into a military buildup. And that's just what the Congress and Administration are doing.

Right now, the annual defense budget is about $47 billion. It looks as if the U. S. will have to live indefinitely with such tremendous outlays.

What does this added military buildup mean to the aerospace industry? Some $4 billion pumped into the economy for more hardware. The new money should start flowing before year-end.

The aircraft business looks a lot brighter right now than it has within the past three years. That's when the Defense Dept. started the push on missiles, and away from aircraft.

Frequently, our customers' alloy castings requirements are so exacting that metallographs must be used as "go" and "no go" gages. Usually, the production needed is high. Always, the tolerances are close.

To cope with such problems, the ECI staff shows an uncommonly high ratio of professionals and specialists. It is actually 1 in 5 (the average for foundries would be several times lower). Among them are a mathematician and statistical analyst as well as metallurgists, mechanical engineers, and engineers of other special fields.

One in every 5—with total staff and factory payroll less than 200. If skill, know-how, and meticulous care can protect your castings procurement, it will pay you to scrutinize ECI.

MAKERS OF QUALITY CASTINGS FOR IMPORTANT COMPONENTS IN THE AUTOMOTIVE, AIRCRAFT, HYDRAULIC, AND SPECIAL MACHINE INDUSTRIES.

ECI

ENGINEERING CASTINGS, INC.
MARSHALL, MICHIGAN

High-Speed Aircraft

"Manned aircraft now under development will achieve very important improvements in the economics of moving people and cargo by air." So says Fred Dickerman, a top engineering management man at Lockheed Aircraft Corp.

He believes these new craft will vastly step up: (1) High speed cargo transportation, both military and commercial; (2) Supersonic passenger transportation; (3) Vertical take-off and landing aircraft, for military and commercial short hauls; and (4) More use of private and corporate aircraft.

What's new on the production lines or in planning stages?

Jet-freighters that will move cargo at 500 mph at 4¢ per ton mile. And the much talked about supersonic jetliner that will take you from New York to Los Angeles in 90 minutes.

Low-Flying Aircraft

The Army's Aircraft Development Program for 1960 to 1970 is moving ahead well. The program covers light observation, manned surveillance, and transport aircraft.

That's the report from Gen. Clyde D. Eddleman, Vice Chief of Staff, U. S. Army.

He points out that the goal is to develop air vehicles which will fly just above the nap of the earth. This will permit the combat soldier to overcome normal terrain obstacles, make for better command control of battle areas, and speed up movements of small units and their equipment to hot battle spots.

The Army's working on a new helicopter for light observation. It

(*Turn to page* 145, *please*)

Circle 171 on Inquiry Card for more data

Circle 172 on Inquiry Card for more data ⟶

NEW...from RCA

The best designed AIR GAGE ever offered!

COMPARE THESE OUTSTANDING FEATURES!

- Four ranges of adjustable magnification are provided with 10" linear scale.
- Tube is spring-loaded with positive seal to provide for simple change and removal.
- Captive float cannot drop out when tube is removed.
- Four spare tubes and scales can be stored internally in the column.
- Modular design permits flexibility in grouping units with minimum space.
- Complete range of tooling is available for gage use.

No other air gage on the market can match the ease and compactness with which these RCA units can be grouped into multiple systems . . . expanded at will at minimum cost. Their attractive functional design with this built-in expansion feature is certain to be a welcome innovation to all users of such equipment.

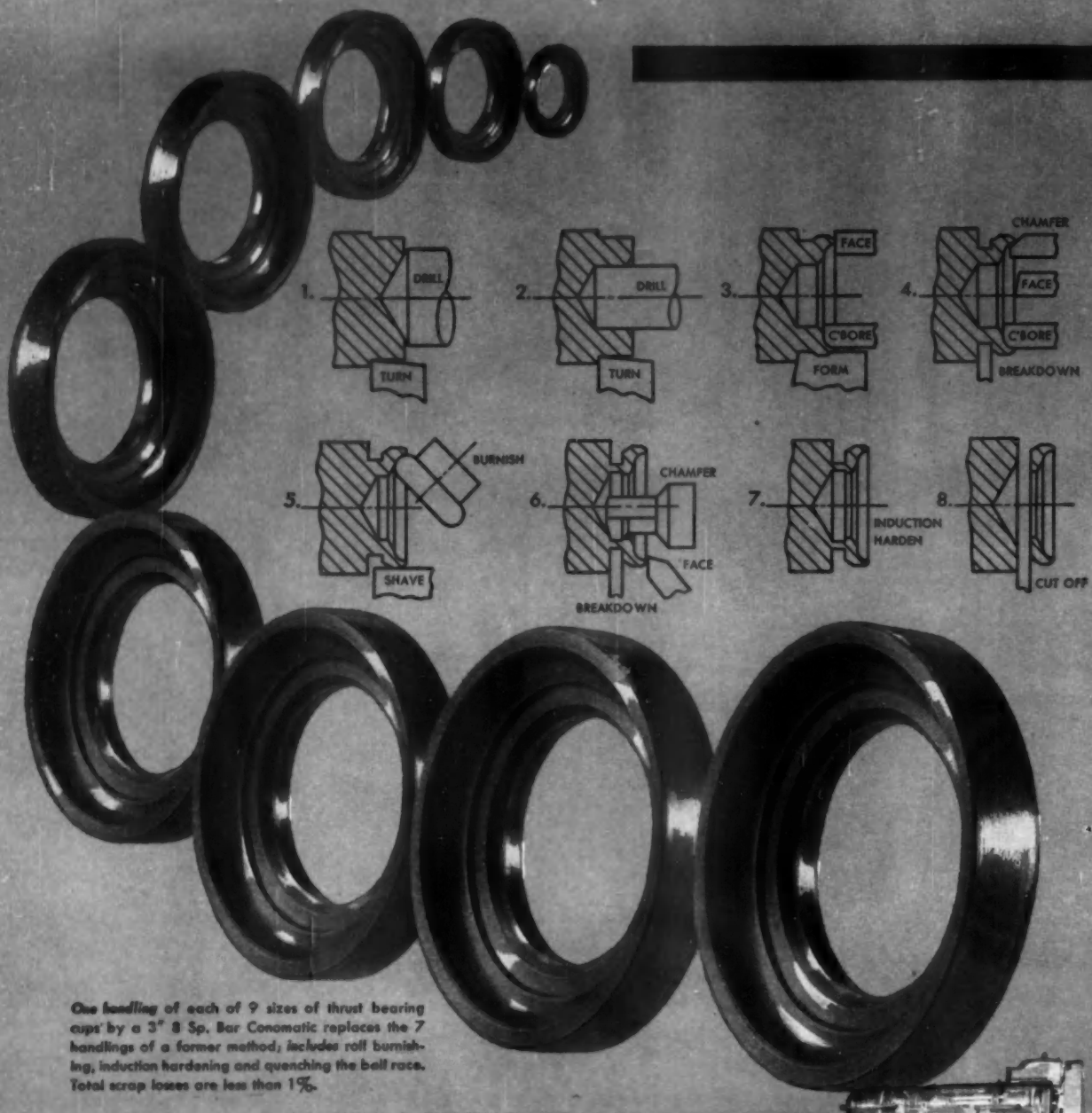
RCA offers these Air Gages as single or multiple units for bench-type operation or as components of automatic systems. A complete range of tooling is also available for all types of measurements normally performed with this equipment.

RCA also manufactures Industrial Computers and Controls, and a complete line of Electronic Gaging Systems, Grinder Controls, Automatic and Bench-type Hardness Testers, Parts Feeding and Assembly Systems and Electronic Comparators. Whatever your automation requirements, RCA offers the most versatile range of equipment available.

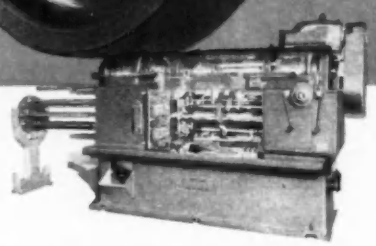
Before you buy Air Gaging, Check RCA. Write to RCA, Industrial Controls, Dept. ZB-432, 12605 Arnold Avenue, Detroit, Mich., or see your RCA Representative.

The Most Trusted Name in Electronics

RADIO CORPORATION OF AMERICA



One handling **of each of 9 sizes of thrust bearing cups by a 3" 8 Sp. Bar Conomatic replaces the 7 handlings of a former method; includes roll burnishing, induction hardening and quenching the ball race. Total scrap losses are less than 1%.**



Those cost-saving EIGHTS!

With more work spindles and tooling positions for including — in one chucking — operations that would otherwise require the expense of second handling, you just can't *beat* THOSE COST-SAVING EIGHTS.

Likewise, as replacements of four spindle machines — on more simple work — with double stock feed and double setup, producing two pieces per cycle, nothing *compares* with THOSE COST-SAVING EIGHTS.

For ever-increasing work requirements — in less floor space, with less power, less coolant, less lubricant and maintenance, and less transfer and paper work — many "automatic" users are finding THOSE COST-SAVING EIGHTS more *profitable*. How about *you*?

Write, wire, or phone *today* for particulars. There is no obligation. Cone Automatic Machine Company, Inc., P.O. Box 27, Windsor, Vermont.

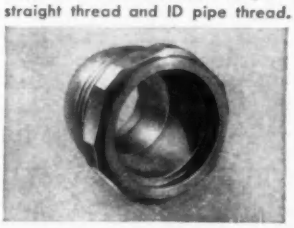
Conomatic

World's Most Productive Line of Automatic Lathes

Circle 173 on Inquiry Card for more data

Consistent, *dependable* handling of one or more of the following operations in a single setup has earned the CONOMATIC an enviable reputation as the *leader* of THOSE COST-SAVING EIGHTS: cross drilling and milling, end milling, broaching, spinning, stamping, OD and ID burnishing, eccentric drilling, turning and boring, eccentric forming, multiple hole drilling and tapping, oil groove rolling, back facing, back slotting, back hole drilling and counterboring, induction hardening and quenching.

One handling **of this SAE 1113 stud by a 1⅝" 8 Sp. Bar Conomatic *includes* rolling one OD pipe thread and cutting the other. Also *includes* cutting OD straight thread and ID pipe thread.**



One handling **of this Ball Joint Housing (1012 steel) by a 2⅝" 8 Sp. Bar Conomatic *includes* burnishing inner ball race.**

One handling **of this Sleeve (B-1112 steel) on a 1⅝" 8 Sp. Bar Conomatic *includes* offset milling.**

One handling **of this Valve Bushing (8620 steel) by a 1" 8 Sp. Bar Conomatic *includes* cross drilling of 4 holes and back counterboring of large hole.**

One handling **of this Threaded Stud on a 1" 8 Sp. Bar Conomatic *includes* cross milling, slotting, thread chasing, and back facing (all operations without stopping the work spindles).**

AIRBRIEFS

(*Continued from page* 142)

will replace three current fixed and rotary-wing types. A gas turbine engine will propel it.

Defense Industry Management

There will be sweeping changes in the defense industry—forced by the Space Age technological explosion.

The growing need is clear—better management.

Here's the picture from a top planner, J. G. Beerer, vice-president-engineering, North American Aviation.

"The truth is that defense companies are becoming custom manufacturers. And the new field of space activity is compounding this trend. Most contracts call for relatively few units, with high technical content for specific applications," Mr. Beerer says.

Price still is an important factor in winning contracts. But equal weight is now given to technical merit, managerial competence, and past performance in meeting cost estimates and delivery schedules.

More and more firms in defense find they have to reorganize to keep up. It means streamlining for better planning and decision-making.

Mr. Beerer puts high stress on: quality control and reliability groups; setup of systems managers and staffs; forming divisions, by either product or function; creation of subsidiaries for special work; and plant acquisitions via purchase or merger.

This applies whether the company is a prime contractor, a sub, or a supplier.

Modified Stratofortress

Boeing is modifying one of its B-52 Stratofortresses to carry a Dyna-Soar manned space glider. When ready, the big ship will release the space craft over Edwards Air Force Base, Calif. Purpose: to test the space glider's stability at slow speeds and to give pilots landing practice. Later air drops will use powered gliders and test the Dyna-Soar at supersonic speeds.

Aerospace Industry Earnings

The aerospace industry's earning rate continued its downward spiral last year. This follows a pattern of decline that started back in 1955.

Earnings-to-sales ratio for all manufacturing was three times greater in 1960 than the ratio for the aerospace industry. All manufacturing: 4.4 per cent of sales. Aerospace: 1.4 per cent.

Brief Airbriefs

Overheard at a joint meeting of Institute of the Aerospace Sciences and American Rocket Society:

More airplanes may be sold for short haul than for any other type of service . . . Aircraft for hypersonic speeds will be slender and blunt-nosed . . . Subcontractors and suppliers got more than two-thirds of the $429 million spent on the Polaris missile system last year.

Production Airbriefs . . . A machine that cuts "around corners" yet doesn't touch its work. The technique was developed at General Dynamics/Astronautics. It's done with an electrical-discharge machine. . . . Post-brazing brazing. It's not double-talk, but a Northrop method of brazing attachments to stainless steel honeycomb panels for the B-70 supersonic bomber. Post-brazing is done on already brazed surfaces but doesn't disturb the previous brazing or the heat treat conditions of the panel. . . .

A new, economical descaling process. Chemists at Rohr Aircraft report excellent results on aircraft and missile components. It's done with a solution, RW 77. Rohr reports success in descaling stainless steel and other alloys without producing intergranular attack and etching of the treated materials. . . .

Air cargo transportation has a bright future. It's growing rapidly. Reductions in both costs and rates will boost the volume of cargo. ■

For a single tank cleaner to do many jobs

ask Oakite

OVER 50 YEARS CLEANING EXPERIENCE • OVER 250 SERVICE MEN • OVER 160 MATERIALS

"RUSTRIPPER" gives you the "universal" tank cleaner . . . removes rust, scale, paint, soils

Here is a remarkable alkaline material with powerful cleaning and chelating action. It conquers a wide variety of soils. In a tank of Oakite RUSTRIPPER, you can remove scale and rust with complete safety. It strips tough paints and phosphate undercoatings with ease. It cleans off metallic smuts, light shop soils, discolorations.

Look at its performance in shop service: "Aircraft parts freed of scale with boiling soak, instead of sand blasting" . . . "oil, welding flux, rust removed in job plating" . . . "soaked steel wrenches give brighter plate" . . . "removes all rust, scale, carbonized oil from diesel liners prior to plating" . . . "displays amazing solution life even though worked very hard" . . . "eliminates pickling and precleaning for barrel-plated screws" . . . "does to bolts in 3 minutes what took pickling 40 minutes". *And that's just a sample.*

Write for Bulletin 9651. Better yet, ask the Oakite man. Oakite Products, Inc., 26 Rector Street, New York 6, N. Y.

it PAYS to ask Oakite

OAKITE

SCIENCE

over 50 *Est. 1909* *years' leadership in industrial cleaning*

MANUFACTURERS' NEWS

(*Continued from page* 140)

riod. In the quarter ended June 30, income increased to $1.7 million, or 63 cents a share from $853,997 or 30 cents a share in the March quarter. Year ago June quarter earnings were $2.3 million, or 81 cents a share.

ACF Net Is $3.58

Combined net earnings of ACF Industries, Inc., and its wholly owned subsidiaries were $5 million, equivalent to $3.58 a share, for the fiscal year ended April 30. For the previous fiscal year, combined earnings were $5.1 million, or $3.64 a share.

AMP Acquires Cook

American Metal Products Co. has acquired Cook and Co., of Arcadia, La., manufacturers of wooden parts and assemblies for the truck and farm implement industries. The acquisition is a further step in AMP's diversification program. It now has subsidiaries and divisions in the automotive, missile, aircraft, plumbingware, office furniture and material handling fields.

Concern Changes Name

National Malleable & Steel Castings Co., Cleveland, has changed its name to National Castings Co. This is the fourth name for the firm, founded in 1868. Five divisions and three wholly-owned subsidiaries operate 12 plants in the U. S. and Canada.

Ling-Temco Merger

Ling Temco Vought, Inc., a merger of Ling-Temco Electronics and Chance Vought Corp., is now operating under its new name. The new corporation has a backlog of $300 million in orders in the aircraft, missile and electronics fields. The new firm employs

(*Turn to page* 148, *please*)

Circle 174 on Inquiry Card for more data

Remember when . . .

his grand slam clinched the pennant

It's the last day of the American League 1945 season—a double header. The Tigers need one more for the pennant. They trail 3-2 as they go into the rain-drenched ninth. A hit, a bunt, a sacrifice and a walk load the bases and Hank Greenberg is up. The St. Louis Browns are looking for a double play. Greenberg makes them look in the left field bleachers.

You can tell a pro by the way he comes through in the clutch. His skill, experience and spirit give him that extra punch.

You'll recognize these same qualities when you work with the engineers and technicians who design and apply Timken® tapered roller bearings. They have the skill to design bearing mountings that cut your assembly costs. Their experience developed the world's most modern bearing plant in Bucyrus, Ohio, to give you higher bearing capacity at lower cost. And the bearing pros are ready to give you the reliability you need to meet today's longer warranty periods. The Timken Roller Bearing Company, Canton 6, Ohio. Makers of Tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits.

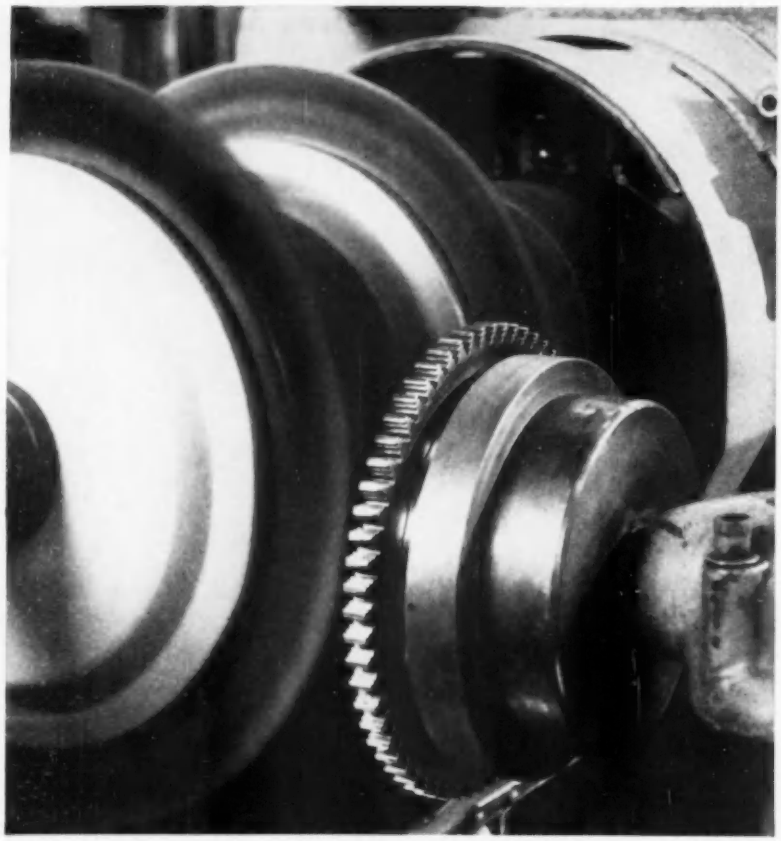
Bearing Pro GEORGE BARKER says: "Hit the long ball—specify Timken bearings!"

TIMKEN®

tapered roller bearings

Made by the pros of the bearing business

Circle 175 on Inquiry Card for more data



GAS TURBINE DISC DOVETAILS are deburred rapidly, automatically on Osborn 3A Finishing Machine using Osborn 14" Tufmatic® power brushes. Cycle time—floor to floor: 5 minutes . . . *9 times faster than former method.*

COST CUT 90% deburring
with OSBORN power brushing

Before: deburring the 64 dovetails broached on this gas turbine disc was a problem for this major producer of jet engine components. Off-hand filing was slow and costly . . . took 45 minutes per part . . . cost about $5.00 per disc.

Now: an Osborn 3A Finishing Machine—equipped with two Osborn Tufmatic® power brushes—deburrs the part automatically in just 5 minutes . . . *9 times faster.* Finishing cost is down to 50¢ per part . . . *a 90% cost reduction.* And production quality is consistently higher, more uniform.

Osborn power brushes and advanced brushing methods can help *you* same time and money on metal finishing operations of every description —deburring, cleaning, polishing, precision blending. An **O**sborn **B**rushing **A**nalysis—made at no obligation in your plant now—is the first step to savings like these. Write or call *The Osborn Manufacturing Company, Dept. E-98, Cleveland 14, Ohio. Phone ENdicott 1-1900.*

OSBORN

Metal Finishing Machines . . . and Finishing Methods
Power, Paint and Maintenance Brushes • Foundry Production Machinery

MANUFACTURERS' NEWS

(Continued from page 146)

20,000. James J. Ling, 38, is chairman of the executive committee. Robert McCullough is board chairman and chief executive officer.

Deere & Co. in Spain

Deere & Co. has acquired a substantial interest in Lanz Iberica, S. A., a major tractor manufacturer in Spain. The Spanish had been manufacturing tractors in Madrid under license from John Deere-Lanz, German farm equipment company.

Firm Changes Name

Food Machinery and Chemical Corp. has changed its name to FMC Corp. Chairman Paul L. Davies said the diversified company, producers of industrial and agricultural machinery, chemicals and defense materiel, had outgrown its name. The John Bean Div. manufactures automotive service equipment for wheels, brakes, frames, and front ends.

Ferry Acquires Baldwin

The Ferry Cap & Set Screw Co., Cleveland, has acquired Baldwin Mfg. Co., Toledo, specialists in the design and manufacture of precision sheet metal parts and assemblies for the automotive, electric, electronic and aircraft industries. Ferry is a leading manufacturer of cold formed fasteners.

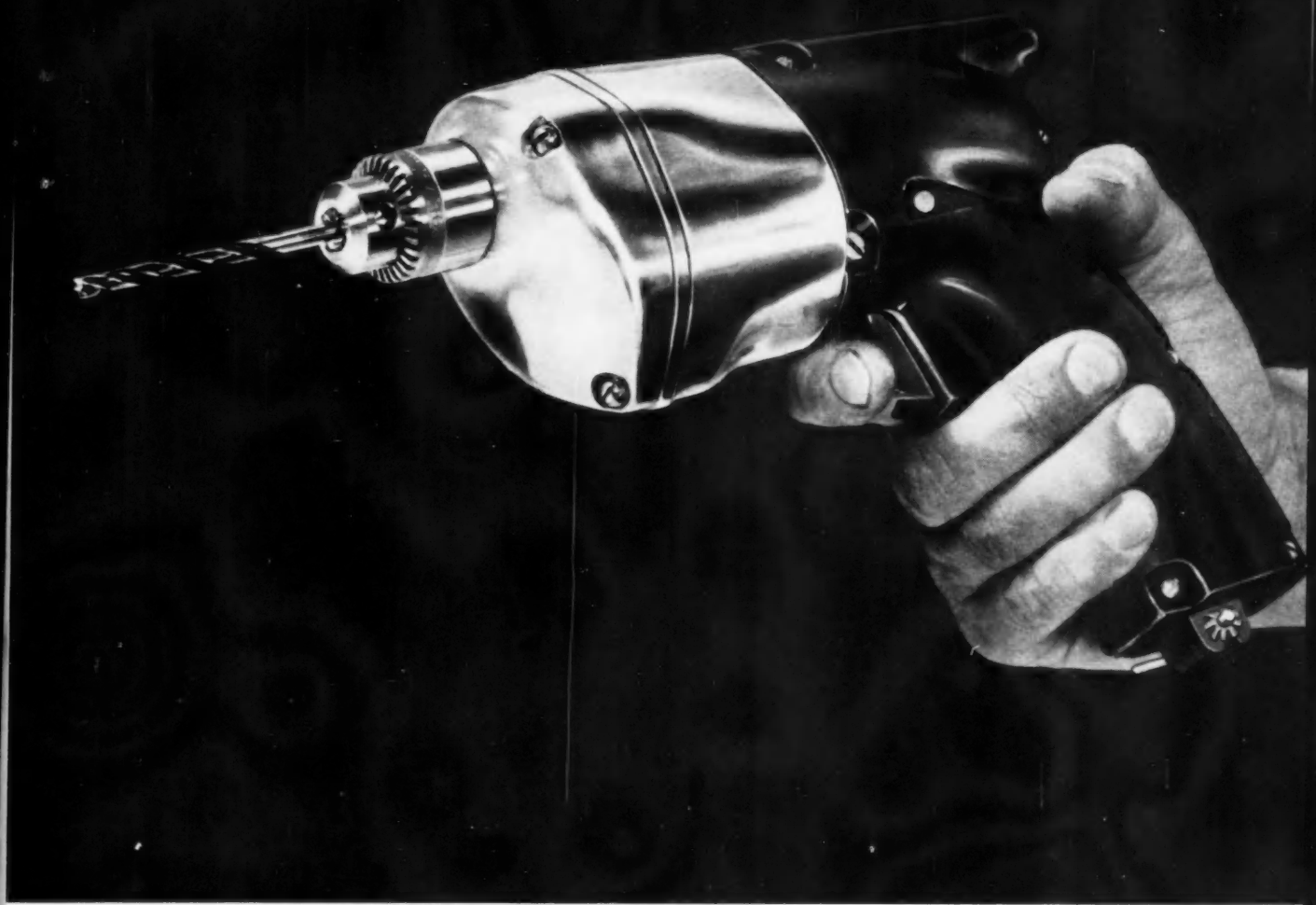
LaSalle Moves to Warren

LaSalle Machine Tool, Inc., celebrating its 33rd year, has moved to Warren, Mich., where it now occupies 65,000 sq ft of floor space. LaSalle makes precision machine tools to build parts for fractional engines, tractors, tanks, aircraft and military materiel, appliances, outboard motors and farm equipment. ■

Circle 176 on Inquiry Card for more data

Circle 177 on Inquiry Card for more data ⟶

TEAMWORK BEATS SCHEDULE IN MARKETING FIRST CORDLESS DRILL



DIES DESIGNED AND CASTINGS DELIVERED IN THREE WEEKS BY DOEHLER-JARVIS!

A 'breakthrough' product means a race against time. Get it in production and on the market while it is still "hot" news.

That was the situation Black and Decker faced in developing the first "cordless" electric drill.

A major time factor—the design and construction of dies and the die casting of three major elements of the revolutionary new product.

The question put to Doehler-Jarvis—can you design and build the dies and deliver aluminum castings for the gear case, gear case cover and field case in three weeks?

The answer—we did it!

The first delivery of completed castings was made in three days less than three weeks.

This is *not* a routine situation. But it is an outstanding example of how Doehler-Jarvis' 57 years of leadership in die casting can work to your benefit in all circumstances. It was the design and engineering skill and experience of Doehler-Jarvis, together with their unmatched production facilities and know-how which helped Black and Decker meet its ultra-tight production schedule.

But there was more to gain than speed. The die cast parts delivered to Black and Decker have the high strength, impact resistance and abrasion resistance needed to take rough handling; they are sound and dimensionally stable to permit and maintain close tolerance; and their attractive finish adds extra sales value.

You will find it to your advantage to talk to Doehler-Jarvis about die castings for your products. Contact the office nearest you.

Doehler-Jarvis

Division of National Lead Company • General Offices: Toledo 1, Ohio
Plants and Sales Offices: Toledo, Ohio; Grand Rapids, Michigan; Pottstown, Pennsylvania; Batavia, New York.
In Canada: Barber Die Casting Co., Ltd., Hamilton, Ontario.
In Brazil: Industrias Doehler do Brasil, S. A., Sao Bernardo do Campo, Sao Paulo.
In Argentina: Doehler Argentina, S. A., Buenos Aires.
In Great Britain: Metal Castings-Doehler, Ltd., Worcester, England.

NEW PRODUCTS

(*Continued from page* 127)

High Strength Adhesive

A new high strength, heat resistant adhesive that can be spray applied in a relatively dry form and requires only contact pressure for bonding a variety of materials is now available.

This synthetic rubber base adhesive, designated as EC-1828, can be used to bond all types of materials including: polystrene, sheet plastic, steel, aluminum, wood, particle board and foamed glass. Because of a new spray technique, excellent filleting properties are obtained; therefore, it is used extensively in the fabrication of honeycomb sandwich panels. Other applications include bonding building panels and metal assemblies.

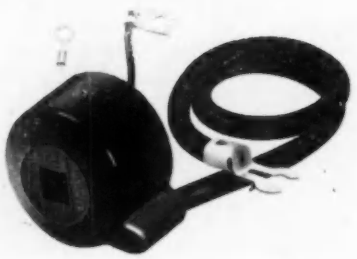
Applying the adhesive in a relatively dry form eliminates most of the solvent content in the applied adhesive and permits the application of the adhesive directly to polystyrene foam without causing any deterioration.

Component parts coated with this adhesive can be assembled, positioned and repositioned if necessary without the components adhering together. After proper assembly, a momentary application of pressure, as achieved with a nip roll, will immediately bond the two component parts together. This adhesive maintains high strength properties over a service temperature range of from −30 to +250 deg F and will meet MIL-P-8053B specifications. One gallon will cover over 300 sq ft of bonding surface. *Adhesives, Coatings and Sealers Div., Minnesota Mining and Mfg. Co.*

Circle 57 on Inquiry Card for more data

Ignition Coil

Announcement of a new type of ignition coil, which eliminates the need for a condenser in a gasoline engine system, has been made. Called an Electronic Coil, the unit contains a conventional secondary winding, but a primary consisting of a coaxially wound, high-distributed-capacity aluminum foil winding. The coaxial windings are metallically connected and inhibit high dielectric stresses found in conventional capacitors. The distributed capacitance serves to augment the ignition spark and to quench the breaker point fire.



According to the manufacturer, not only does this new hermetically sealed coil save the cost (and possible failure) of a condenser, it actually creates a hotter spark than standard coils delivering an equal voltage. Company engineers state that calorimeter tests show that the Electronic Coil gives calorimeter readings equal to those of coils of substantially higher voltage, and that its voltage is quite sufficient to break down a spark plug under compression. *Syncro Corp.*

Circle 58 on Inquiry Card for more data

Microfilm Camera

Automatic exposure control and automatic light meter return are featured in microfilm cameras for office records.

Designed to speed microfilming tasks and increase efficiency, the ex-

(*Turn to page* 156, *please*)

One master key opens all these doors!

For Industry's Aluminum Casting Needs! . . .

After 40 years of leadership in the field of quality permanent mold aluminum castings, we're better able to serve the needs of industry; aircraft, appliance, automotive, building, electrical equipment, to mention just a few.

Our plants at St. Charles, Missouri and Carmi, Illinois and those of our recent acquisitions, Grapho Products, Incorporated at Lawrence, Indiana and Rich Manufacturing Corporation at Battle Creek, Michigan, make us decentralized and diversified enough to serve you efficiently and economically anywhere in the nation.

These locations provide 650,000 square feet of molding facilities, capable of turning out 110,000,000 pounds of high quality permanent mold aluminum castings every year.

In addition to our volume production and long experience, we will give you complete engineering services and the finest quality control.

WRITE US TODAY FOR COMPLETE INFORMATION

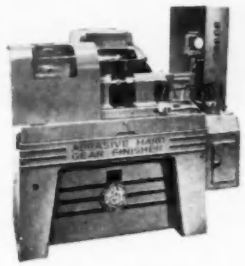
STERLING ALUMINUM PRODUCTS INC.

General Offices: ST. CHARLES, MISSOURI

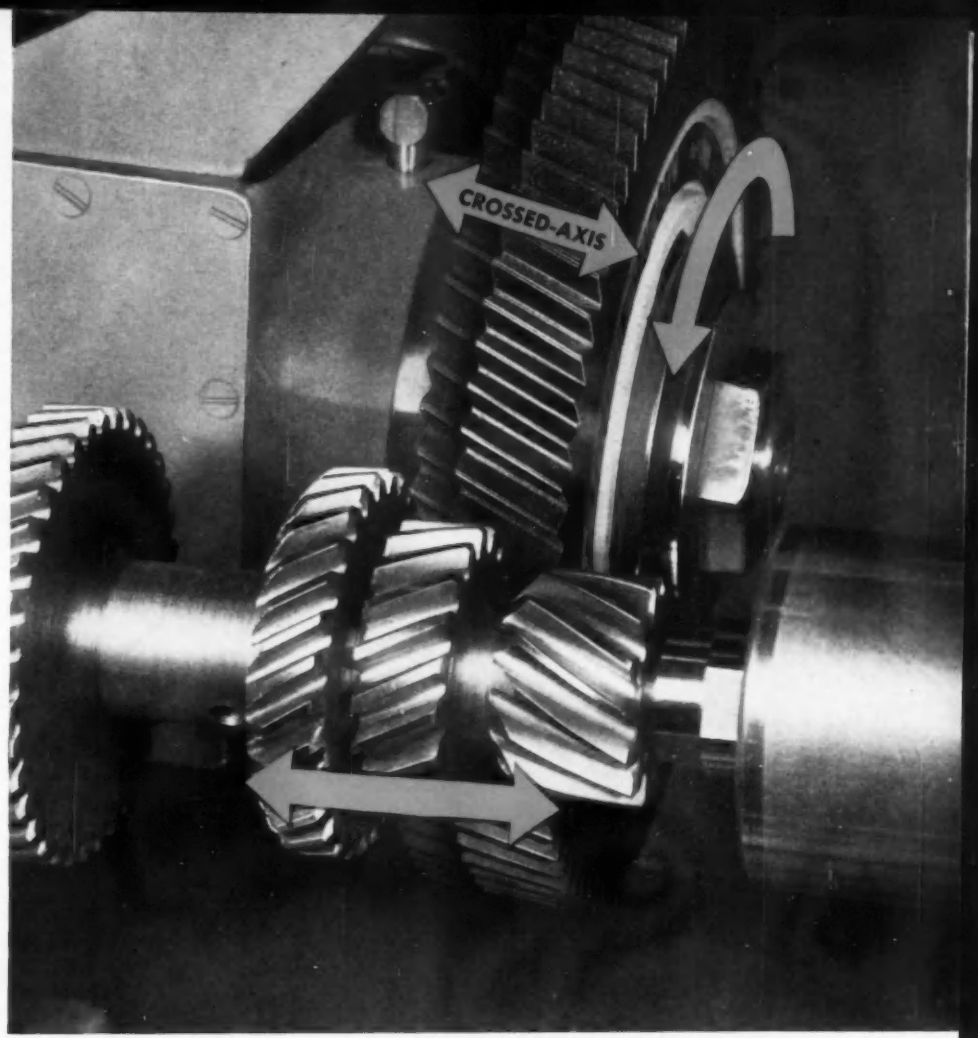
Circle 178 on Inquiry Card for more data

Circle 179 on Inquiry Card for more data ⟶

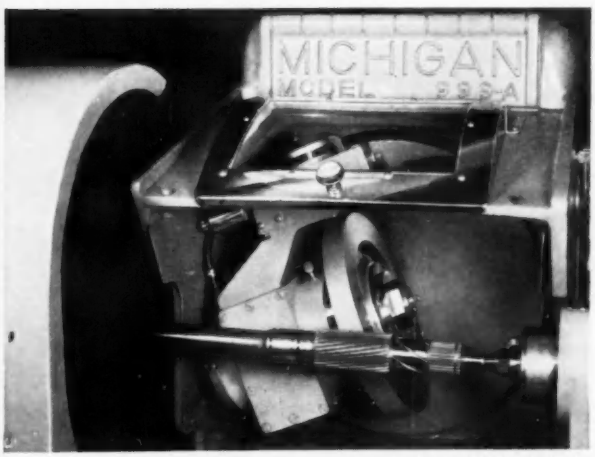
NEW



FOUR-MOTION GEAR FINISHING PROCESS GIVES...



TRUE HONING ACTION!



Smooth hone may be used to finish OD's in certain applications.

The new Michigan 999-A Abrasive Hard Gear Finisher uses four separate but integrated motions to give better surface finish on hardened gears and cylindrical parts. Nicks, burrs, some errors in lead and runout, involute, etc. are quickly corrected with newly developed hones of high-strength plastic available in a wide range of abrasives.

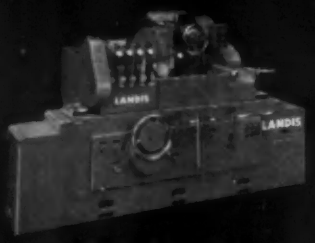
The hone (1) oscillates axially at high speed while (2) the work is reciprocated across the hone, (3) the gear is rotated—under controlled pressure—in mesh with the hone causing (4) sliding action due to crossed-axis of work and hone. This "Four-Motion" process results in smoother, quieter running parts.

Independently variable speeds and up to 25° hone head swivel will accommodate a wide variety of workpieces. Crowning-taper attachment, automatic loader, internal gear attachment and tool dresser are available as optional equipment. For full details write for Bulletin 999-A.

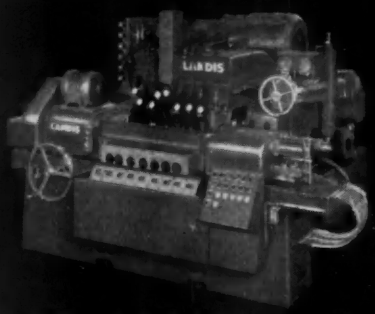
A head modification kit to convert Michigan Model 999 to the new process is available.

MICHIGAN TOOL COMPANY, 7171 E. McNICHOLS RD., DETROIT 12, MICHIGAN

Automatic Race grinder

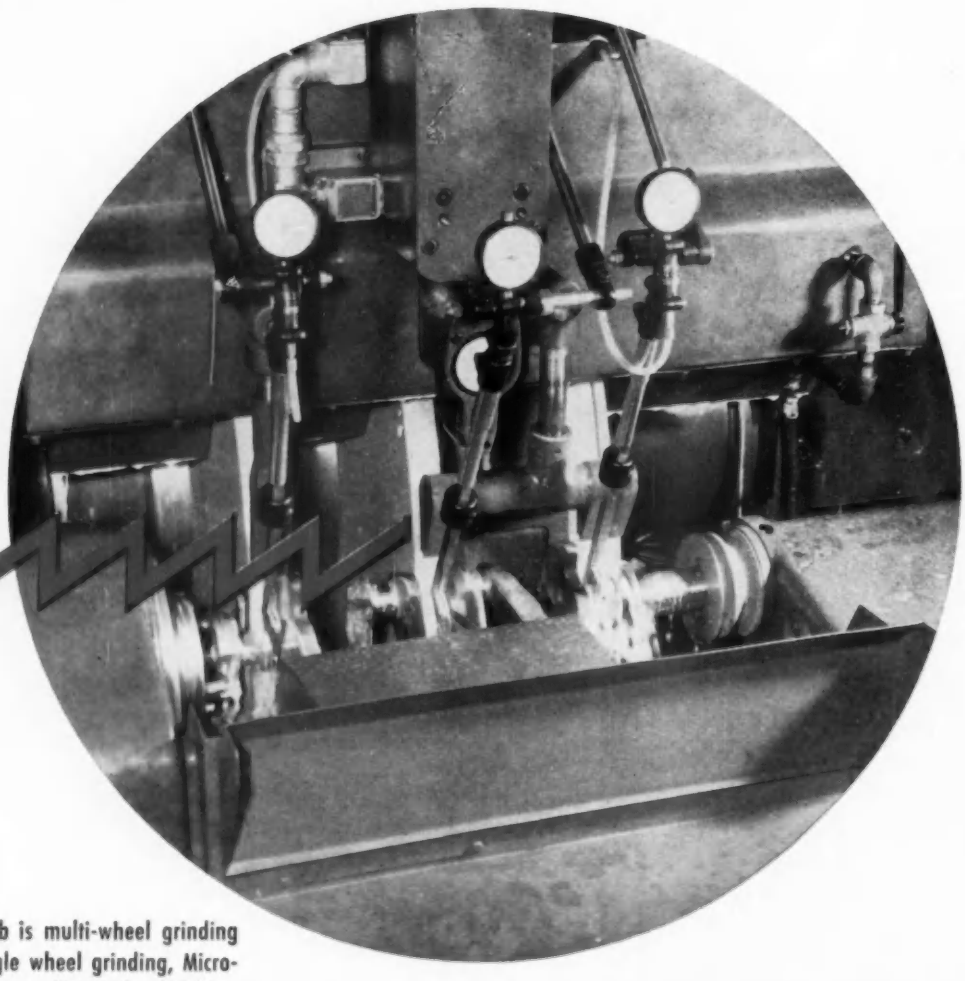


10″ R Plain grinder



14″ IWR Multiple Wheel grinder

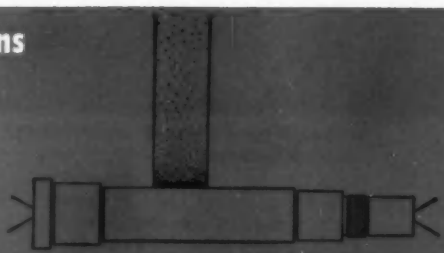
Landis production grinders with Microfeed®



Whether your job is multi-wheel grinding like this, or single wheel grinding, Microfeed will assure quality and reliability.

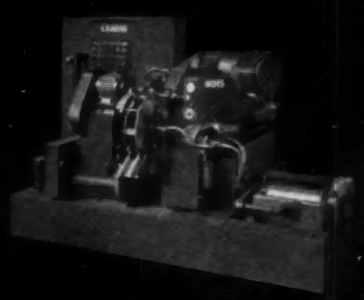
typical Microfeed applications

tapered bearing race
specified size tolerance: .0002″



multiple diameter shaft
specified size tolerances: .0001″

Circle 180 on Inquiry Card for more data



Automatic Plunge grinder

Automatic Crankpin grinder

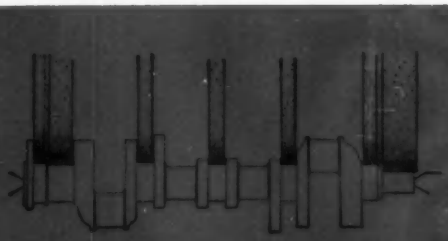
deliver closer tolerances consistently

Microfeed

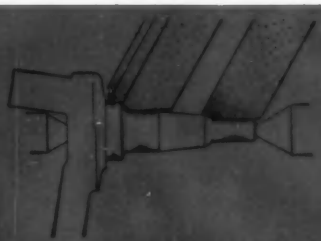
- a new Landis precision wheelfeed that is a major breakthru in size control
- specified on new Landis grinders, Microfeed assures cylindrical grinding precision to your specified tolerances on a production basis
- automatically cancels all variables affecting work size

LANDIS

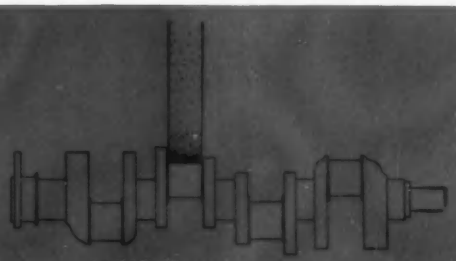
LANDIS TOOL COMPANY, WAYNESBORO, PA.



crankshaft line bearings
specified size tolerances: .0005"

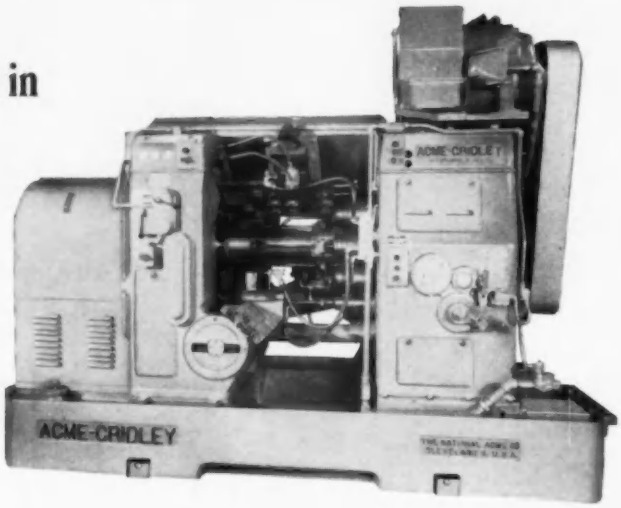


steering knuckle
specified size tolerance: .0006"



crankshaft pins
specified size tolerances: .0005"

Major breakthrough in shaft production . . .



Acme-Gridley multiple-spindle shaft machine equals output of four automated lathes

At Chrysler Corporation's Trenton, Michigan, Engine Plant, a remarkable new National Acme shaft turning machine has slashed camshaft production costs; is hailed as a major production development for the entire industry. Performing complete shaft journal machining in a single set-up, this rugged 6-spindle automatic provides substantial savings in floor space and capital outlay, reduces scrap loss and enables closer control of machining operations.

Key to this dramatic pay-off are imaginative National Acme solutions to the difficult problems of centering, driving, and stabilizing the long, flexible shaft during turning operations. An ingenious part-holding technique exposes bearing journals for turning—an impossibility in a chucking set-up.

Extreme capability is stressed in the design of the Universal Multiple-Spindle Shaft Turning Machine and permits the maximum number of machining operations to be performed on straight or flanged shafts held between centers.

The shaft turning machine is additional evidence of National Acme know-how applied to the solution of special machining problems. This same insight and ability is available to any manufacturer interested in reduced costs and increased production. Our representative is as close as your telephone.

National Acme's "Zone of Responsibility" includes all phases of cost reduction. Check YOURS . . . Then Check National Acme

Direct Costs: these include direct dollar savings as realized by Chrysler Corporation . . . an "everyday" job for Acme-Gridleys. **Indirect Costs:** effecting important savings in maintenance, downtime, scrap reduction, tool costs, etc. **Product Redesign:** teaming with your design group to take full advantage of Acme-Gridleys' cost reducing capabilities. **Direct Material Costs:** our engineers provide important savings in this area by constantly matching machines and tools to modern metallurgical problems. **Make-or-Buy Reviews:** in many cases our Contract Division can assume your production headaches and relieve you of immediate capital investment. **Spot Modernization:** pioneering in modern tooling methods, and the flexibility of Acme-Gridleys can provide many "on-the-spot" savings.

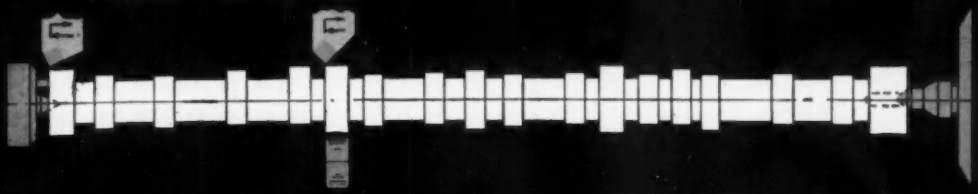
National Acme

The National Acme Company
181 E. 131st Street
Cleveland 8, Ohio

Sales Offices: Newark 2, N.J.; Chicago 6, Ill.; Detroit 27, Mich.

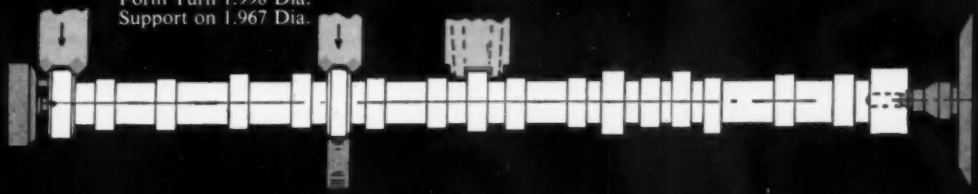
Circle 181 on Inquiry Card for more data

1st position—load and unload

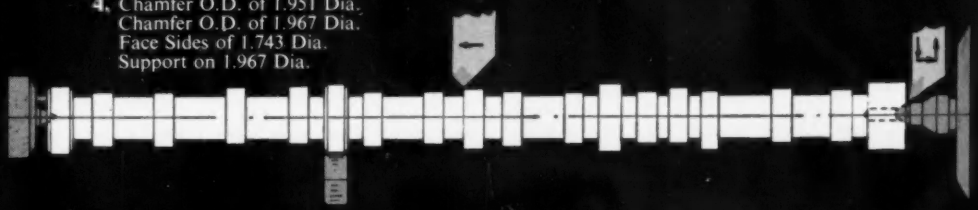


2. Form Turn 1.951 Dia.
Form Turn 1.967 Dia.

3. Form Turn 1.982 Dia.
Form Turn 1.998 Dia.
Support on 1.967 Dia.



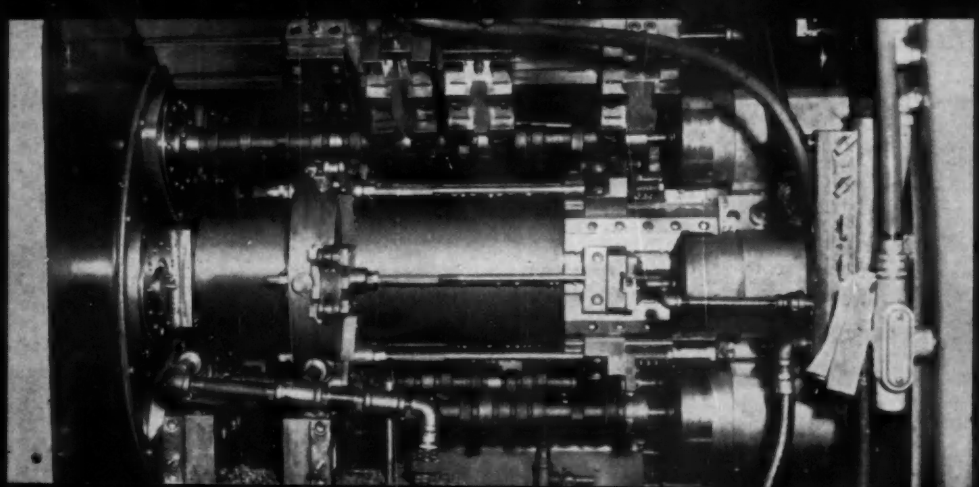
4. Chamfer O.D. of 1.951 Dia.
Chamfer O.D. of 1.967 Dia.
Face Sides of 1.743 Dia.
Support on 1.967 Dia.



5. Face End of Camshaft
Relieve Turn 1.743 Gear Dia.
Support on 1.967 Dia.

6. Chamfer O.D. of 1.743 Dia.
Chamfer O.D. of 1.982 Dia.
Chamfer O.D. of 1.998 Dia.
Support on 1.967 Dia.

High-test cast iron camshaft with journal machining completed . . .
13 operations in 22 seconds.



Close-up of tooling zone. Open spindle in load and unload position shows unique centering, holding and driving mechanism.

NEW PRODUCTS

(*Continued from page* 150)

posure control, for example, can be set for repeat exposures from one up to twenty images, by selection on a single control knob.

A warning buzzer and signal light warn operator when the last exposure has been made and the unit automatically swings the light meter into center board position to determine light values for illumination of the next original. The light meter return can also be activated manually by depressing a control button on the illumination unit or the automatic exposure control panel. *Charles Bruning Co., Inc.*

Circle 59 on Inquiry Card for more data

Air-Valve Carburetor

A new carburetor, called the Stromberg CD, is reported by the manufacturer to be especially well suited to high performance cars and features smooth acceleration at low manifold vacuum.

The new unit was designed with fewer parts than a conventional carburetor, according to the report. The carburetor was designed with a new type manual choke for cold starting that accomplishes starting enrichment without sliding jets and fuel seals. The new unit is designed for horizontal or semi-downdraft mounting.

The air-valve principle uses modified manifold vacuum, or engine suction, to provide the proper air-fuel mixture at all throttle positions. *The Bendix Corp.*

Circle 60 on Inquiry Card for more data

Ruggedly Built

—AND THOROUGHLY PROVED BY YEARS OF HARD EVERYDAY USE IN THOUSANDS OF PLANTS

HANSEN

ONE-WAY SHUT-OFF

QUICK-CONNECTIVE
PUSH-TITE COUPLING

Here's the fluid line coupling that can really take it. The ability of Hansen Push-Tite Couplings to withstand severe service—with practically no maintenance—has been thoroughly proved by years of hard, everyday use in thousands of plants.

To connect a Hansen Push-Tite Coupling, you merely push the Plug into the Socket—as easily as plugging in your electric shaver. Flow is automatic—instantaneous. Plug swivels freely—no kinking of hose. To disconnect, pull back sleeve on Socket. Instantly and automatically, Socket shuts off flow of air or liquid.

QUICK
CONNECTION AND DISCONNECTION
INSTANT
AUTOMATIC FLOW OR SHUT-OFF

Leak-Proof, Minimum Wear Locking Device

Locking pins in Socket afford uniform large area contact with Plug—thereby preventing wear and subsequent leakage. The socket head, containing locking device, is factory assembled into a rugged integral unit which cannot be readily injured or have component parts lost by casual tampering.

Write for the HANSEN Catalog

Here is an always ready reference when you want information on fluid line couplings in a hurry. Lists complete range of sizes and types of Hansen One-Way Shut-Off, Two-Way Shut-Off, and Straight Through Couplings.

Representatives in Principal Cities ...See Yellow Pages

SINCE 1915 — QUICK-CONNECTIVE FLUID LINE COUPLINGS

THE HANSEN MANUFACTURING COMPANY

4031 WEST 150th STREET • CLEVELAND 35, OHIO

Circle 182 on Inquiry Card for more data

Filter Line Gauge

Unnecessary replacement of filters by periodic inspection can be eliminated by utilizing a newly developed line filter with a filter condition indicator. This built in pressure gauge indicates at a glance when the filter element is in need of cleaning or replacement.

The new full-flow filter is a half-gallon size with 1¼ in. NPTF ports at inlet and outlet. It may be installed in either the suction line (between tank and pump) or the return line (between control valve outlet and tank).

A built in by-pass valve protects the filter element which may be either a reuseable, 200 sq in., 100-mesh (140 micron) monel wire cloth element or one of two interchangeable, disposable, 1400 sq in., phenol treated, paper elements of 10 or 33 micron porosity.

With wire-cloth element, the filter passes up to 60 gpm with a pressure drop of only 5 psi. *Gresen Mfg. Co.*

Circle 61 on Inquiry Card for more data

Descaling Solution

A single solution has been developed for immersion bright dipping

The Finest Turbocharger

SCHWITZER
CORPORATION
INDIANAPOLIS 7, INDIANA U.S.A.

PRODUCTS WITH A NEW APPROACH

- TURBOCHARGERS • SUPERCHARGERS • FAN BLADES • FAN DRIVES
- VIBRATION DAMPERS • AIR STARTING MOTORS • COUPLINGS
- WATER PUMPS • IMPELLERS • SHAFT SEALS • AIR PUMPS

Schwitzer Products are manufactured Internationally

Circle 183 on Inquiry Card for more data

NEW PRODUCTS

(*Continued from page* 156)

and descaling stainless steel at the same time.

The new product, designated number 205 Stainless Descaling Solution, offers a simple means of obtaining bright finishes on stainless steel, at the same time holding close tolerances. The removal of both welding and heat treating scale also is accomplished. In addition, the entire process is performed without the use of current.

This solution also has proven to be highly effective in removing tarnish from copper and brass with a minimum amount of metal loss. It also is an excellent descaling and semi-brightening material for Kovar and other high nickel alloys.

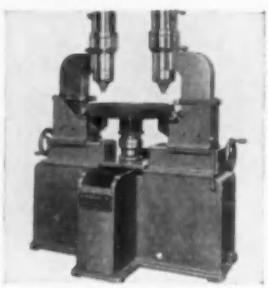
The toxicity of number 205 Stainless Descaling Solution is at a low level due to the elimination of hydrofluoric acid and other fluorides often found in other bright dipping formulations. *Fidelity Chemical Products Corp.*

Circle 62 on Inquiry Card for more data

"Hy-Power" by HANNIFIN
5,000 PSI HYDRAULICS

Proved by more than 25 years use in the Automotive Industry

BETTER THAN EVER TODAY



FAST • QUIET • POWERFUL...EASY TO MAINTAIN

PRODUCTION TOOLS

Used on trucks, trailers, automobiles and throughout industry

Used for riveting, punching, pressing, marking and press-fit assembly

LIGHTWEIGHT PORTABLE TOOLS
GAP OR COLUMN PRESSES • POWER UNITS • CYLINDERS
STANDARDS AND SPECIALS

3162PH

In use throughout the world

Call in your nearby Hannifin man—he's a trained production analyst—

PARKER-HANNIFIN
HANNIFIN COMPANY DIVISION
543 South Wolf Road • Des Plaines, Illinois
PNEUMATIC AND HYDRAULIC SYSTEM COMPONENTS
EUROPEAN DIVISION • PARKER-HANNIFIN N.V. • SCHIPHOL • THE NETHERLANDS

Circle 184 on Inquiry Card for more data

METALS

(*Continued from page* 56)

About 90 per cent of the Chilean output was cut off in mid-August by strikes at all the American-owned copper mines, which had been turning out about 50,000 tons a month. Workers at two of the struck mines walked out in sympathy, but they are not expected to continue off their jobs for any great length of time. The strike at the third mine is more serious, and may continue for some weeks. The work stoppage, if long continued, is bound to tighten the copper supply as Chile supplies about 16 per cent of the Free World copper production. Interference with Europe's normal supply of copper will probably lead to higher prices abroad, and this could bring about exports from U. S., with a consequent price hike in the N. Y. market from the present 31 cent level.

U. S. brass mills shipments in the first half of 1961 climbed about 50 per cent over those in the same 1960 period and sentiment in the Connecticut Valley has measurably improved with firmer prices and near disappearance of price cutting.

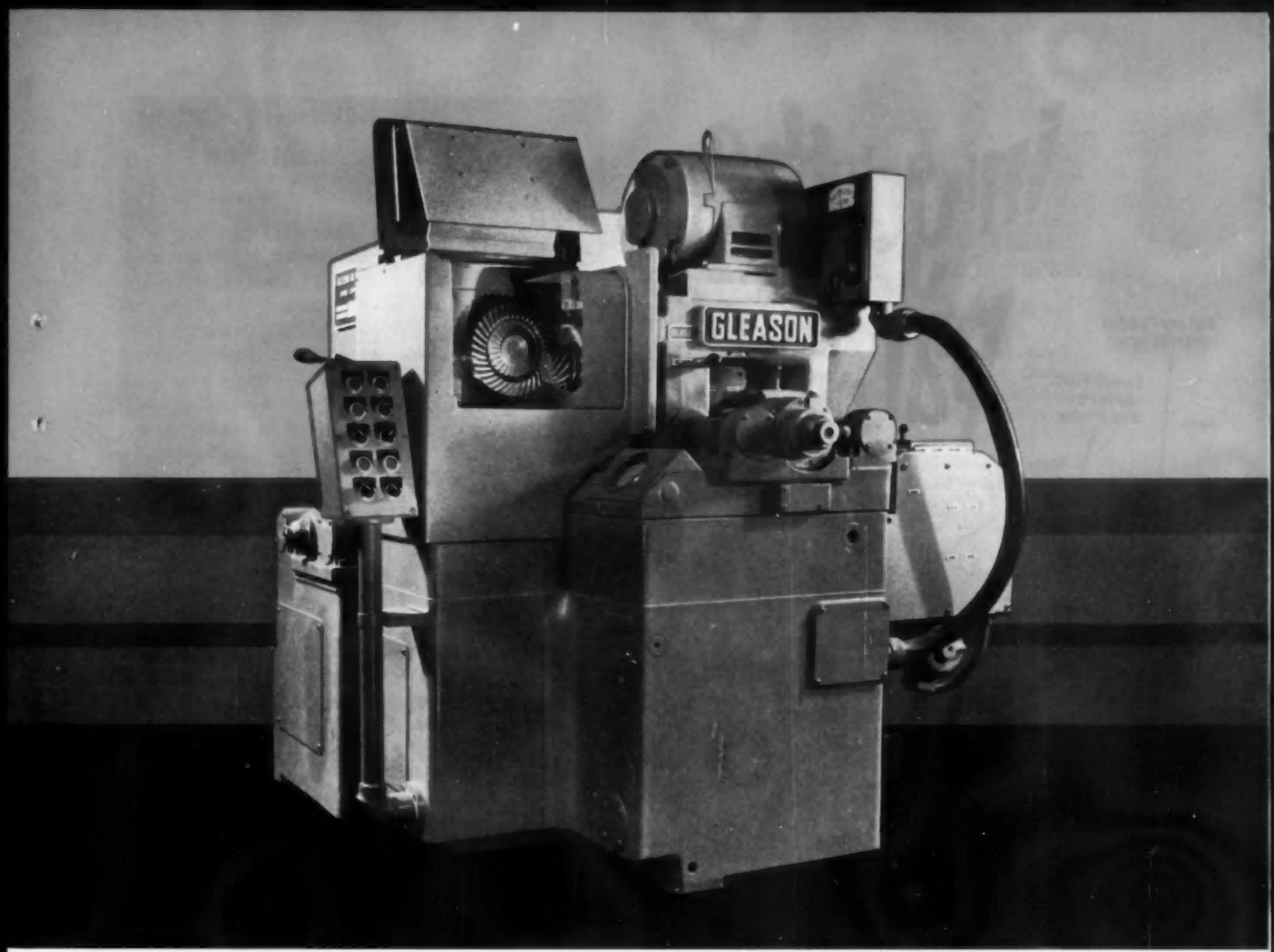
Good Demand for Prime Western Zinc

Zinc statistics for July were excellent, considering it is the traditional vacation month. Domestic shipments totaled nearly 69,000 tons. Stocks of zinc at the end of the month were reduced. This was in sharp contrast with a year ago, when shipments were only 54,000 tons and stocks jumped 20,000 tons. As usual, most of the business was done in Prime Western grades. Special high grade was in easy supply, with price discounts common. Die casters are holding off giving large orders for the premium grades pending the outcome of the auto labor negotiations. ■

Cessna Gets Contract

Cessna Aircraft Co. has received letter contracts totaling approximately $5 million from the Air Force for additional T-37B jet aircraft.

Circle 185 on Inquiry Card for more data



New "Swing Pinion Cone" concept basic in Gleason No. 503 Hypoid Lapper

SPC is a completely new concept in the lapping of spiral bevel and hypoid gears. With this method, improved refinement of tooth surfaces is obtained, resulting in quieter, smoother-running gears.

SPC is accomplished on the No. 503 Hypoid Lapper by actually pivoting the pinion member in a horizontal plane about a point that is the approximate center of the tooth mesh. This motion, combined with a corresponding horizontal movement of the pinion member during the lapping cycle, moves the contact uniformly over the entire tooth surface to insure complete lapping.

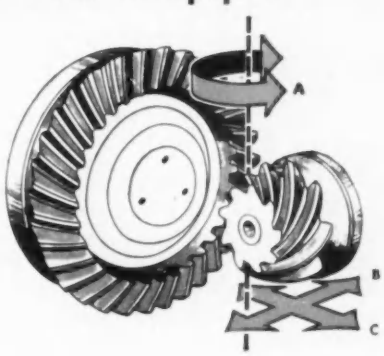
Previously prolonged lapping has been a major problem. However, extended tests have conclusively proved "prolonged lapping" with SPC does not have a major effect on the tooth contact pattern or tooth shape. This feature removes the problem of decreasing the amount of pinion axial adjustment during assembly.

Completely Automatic Cycle. Once the correct lapping cycle is established, all of the motions are completely automatic. Complete control of the lapping cycle, including such features as faster lapping time, independent lap of coast and drive side and proper backlash, are independently set through a convenient "dial-in" system.

Faster Production. An increase of approximately 20% productivity is obtained on the No. 503 Hypoid Lapper employing SPC.

The No. 503 Hypoid Lapper is a high production lapper, intended for automotive or custom gear shops, and accommodates 90° shaft angle gears up to 10″ in diameter. The No. 504 Hypoid Lapper, our larger model, will handle gears up to 36″ in diameter. Shaft angles on this machine can be extended to a 10°-160° range.

For more information and specifications, please write for technical bulletins.

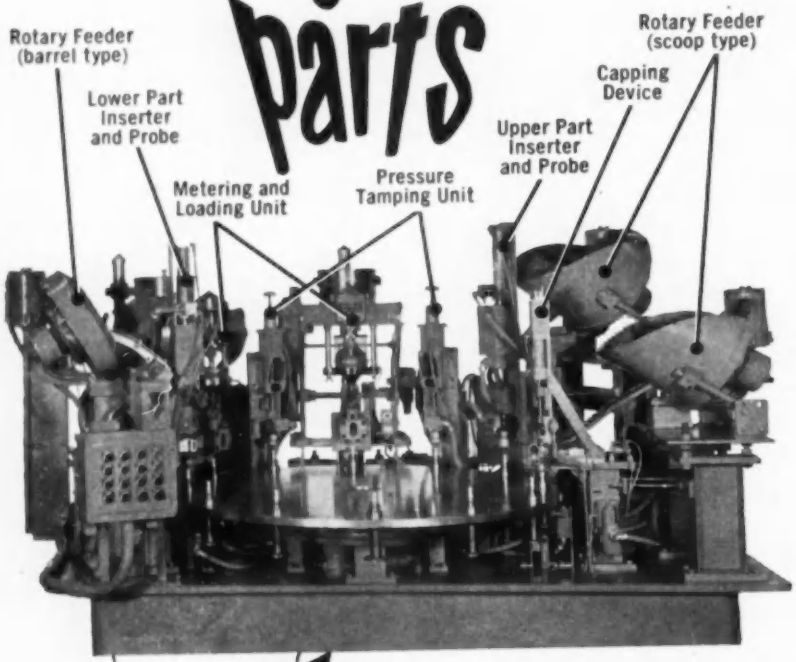


SPC LAPPING MOTIONS: The swing motion of the pinion head (A) moves the bearing along the length of the tooth. The axial motion of the pinion head (B) moves the bearing up and down the tooth profile, while the motion of the pinion head in the direction of the gear axis (C) maintains constant backlash.

GLEASON WORKS

1000 UNIVERSITY AVE., ROCHESTER 3, N. Y.

in go the parts



OUT comes the assembly

faster . . . better . . . at lower cost with a DPS special assembly machine

Micro-parts, or parts many, many, times their size . . . parts of almost any shape or material go together fast, automatically, and accurately in DPS special assembly machines. DPS experienced engineers will combine rotary feeders . . . vibratory feeders . . . elevating feeders . . . and power screwdriving machines with other processing equipment to feed, orient and assemble parts. If you have an assembly problem, let a DPS engineer analyze your production line. DPS special assembly and processing machines can give you higher-speed production . . . better quality control . . . and substantial reduction in assembly costs. Write today.

15,726

DETROIT POWER SCREWDRIVER CO.

A Subsidiary of Link-Belt Company

Selective Parts Feeders; Screw, Nut and Stud Driving Machines; Special Purpose Assembly Machines

2825 W. Fort Street
Detroit 16, Michigan
TAshmoo 5-3070

Why Review Production Equipment Now?

(*Continued from page* 75)

ity since the weakest link will penalize the customer. From now on each supplier must give assurance that his product is built to the desired standard of quality. This raises competition among parts makers on a still higher level. To stay in business as a supplier, even those who produce in smaller numbers must make sure that methods and equipment are the best the art affords.

Deterioration With Age

We find another area of activity that requires attention. Forging machines, large presses, upsetters, etc., are big rugged items of equipment designed to last for 20 or 30 years. And in many, if not most, instances this expensive equipment has been permitted to carry on until exhausted. One reason for this is that in this field there is little obsolescence, certainly not to the degree found in metal-cutting machinery. Yet the performance of even the big rugged machinery is bound to deteriorate with time and usage. Bearings wear, gears wear, clutches give out, parts may break.

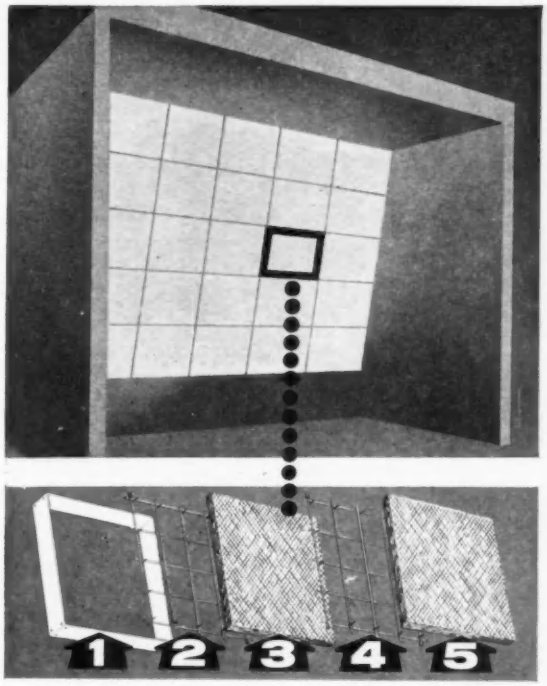
It would be profitable to appraise such equipment, to seek out the places where a new machine will unquestionably improve both productivity and quality and reduce spoilage. We must bear in mind that even on the big machines there are small improvements made at various times that add up to make a new machine excel by comparison. Even though large presses and forging machines have not changed radically, the newer ones have better acting clutches and brakes, improved safety features and the like. There are hidden economies here that can be converted to important cost advantages.

Adoption of JIC Standards

JIC standards have been imposed on all equipment built in recent years. To the plant executives these standards mean vastly better equip-

(*Turn to page* 162, *please*)

Circle 186 on Inquiry Card for more data



A Paint Arrestor module consists of a Holding Frame (1), two Snap-in Grids (2 and 4), two Paint Arrestors (3 and 5). Loaded Paint Arrestors are simply replaced as necessary. And, they're also ideal for air-borne ink, mist, dye, frit, etc.

CONTROL PAINT OVERSPRAY the inexpensive, effective way!

The advantages of R P Paint Arrestors, the inexpensive, disposable air filters are many. Overspray solids are trapped before they reach the exhaust stack... to reduce fire hazards, damage to adjacent property... disagreeable and time-consuming maintenance work. Installation? —easy and fast. Maintenance? —remove loaded Paint Arrestor and replace a new one. Adaptability? —ideal for any type, any size booth, new or existing.

RP PAINT ARRESTORS

UL Listed

RP | *Products of Research*

RESEARCH PRODUCTS *Corporation*

Dept. 310-I, MADISON 1, WISCONSIN

Circle 187 on Inquiry Card for more data

SPECIAL LOCKNUTS . . . *that solved fastening problems*

As the largest specialized nut manufacturer in the world we are constantly developing new methods and products for this phase of assembly in industry . . . in the field of locknuts we have made spectacular progress. Besides standardized hexagon "Conelok," "Huglock" and "Marsden," sizes #10—3" of ferrous and non-ferrous materials, we provide many special application nuts, upon a basis of these designs . . . a few of which are here shown . . . Our sales and engineering departments are available to help you solve your fastening problems . . . Send for 12-page condensus catalog, it includes complete specifications of our entire product, as well as engineering data. We also have an one hundred and forty four page catalog where more comprehensive information is required.

Manufacturers of Standard and Special ferrous and non-ferrous Hexagon, Square and "12 Pointer" nuts . . . "Conelok," "Huglock" and "Marsden" locknuts.

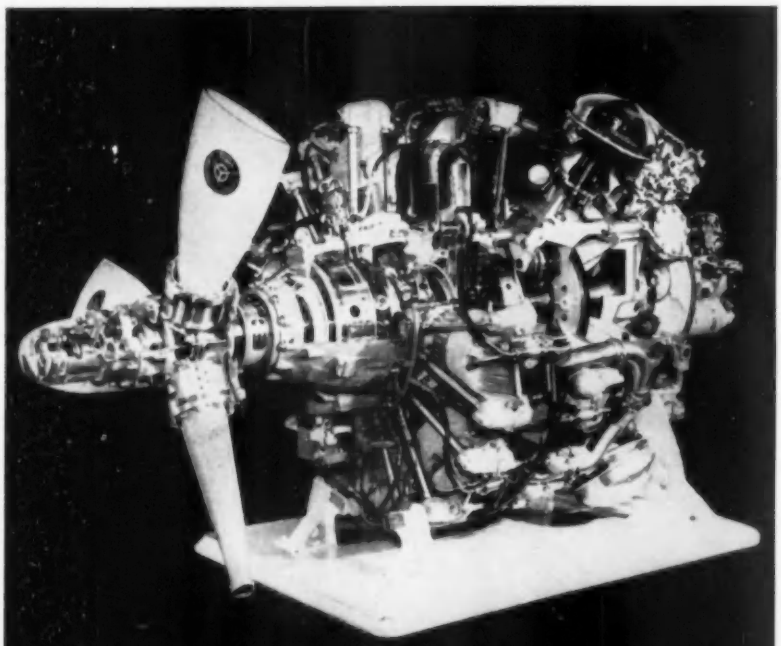
NATIONAL MACHINE PRODUCTS COMPANY

an SPS company 44250 UTICA ROAD UTICA, MICHIGAN

Circle 188 on Inquiry Card for more data

LUBRICATION REPORT

(assembly and run-in)



Application: *Coating piston skirts in aircraft engines.*

Problem: *To avoid damage to pistons during critical run-in period.*

Solution: *'dag'® Dispersion 213 — graphite in an epoxy-resin binder — spray applied.*

RESULT: *HIGHLY EFFECTIVE RUN-IN PROTECTION PLUS EXTENDED PISTON LIFE*

The Wright Aircraft Division of Curtiss-Wright Corporation has devoted much time to the critical run-in for radial, reciprocating aircraft engines. The exacting tolerances of this engine design require perfect friction and heat control under all speed and load conditions during the run-in process. To best satisfy these requirements Acheson 'dag' 213 was specified as the run-in lubricant. 'dag' 213 successfully served in many areas of assembly and run-in because of its protective coating properties, dependably uniform consistency and excellent adhesion. So successful was the application for preventing scuffing, scoring and seizing during run-in that the use of 'dag' 213 has been extended to all models of Curtiss-Wright engines in both their 9 and 18 cylinder categories.

Acheson research has developed an extremely broad line of dry film lubricants to meet the technical and economical in-plant requirements for assembly and run-in applications.

Photo courtesy of Curtiss-Wright Corp.

Check your present assembly and run-in lubricant against what Acheson lubricant specialists can offer you. Send for Acheson Bulletin No. 421. No obligation.

ACHESON Colloids Company

PORT HURON, MICHIGAN

A division of Acheson Industries, Inc.

Sales offices in principal cities.

Also Acheson Industries (Europe) Ltd. and affiliates, London, England

ment, with greater freedom from maintenance problems, easier to fix if there is trouble. But this is true only of the newer equipment. It would be worth the effort to learn how much of the equipment in a given plant still has many items without the benefits of JIC, without the safety and low maintenance that JIC standards imply. Here is an excellent area for further economy of operation.

We believe, too, that if the automotive industries as a group intensify work on a regular program of machinery replacement and place greater emphasis upon modern methods this will support the work of those who are working in Washington in an effort to revise the wornout and obsolete depreciation schedules now current in BIR.

Although we have kept our readers abreast of developments in automation and the versatility of the modern transfer machines, it would be well to make some additional comment at this time. When transfer machines first came on the scene, largely after WWII, they were intended primarily for the machining of large parts required in large numbers. Even the reliability of transfer machines was questioned in the early stages of adoption. Today we know that the transfer machine not only is reliable but comparatively trouble free. Later developments made it possible to adapt this equipment to the machining of smaller parts. Several instances have demonstrated that the transfer machine need not be earmarked for long runs of a single part.

Engine builders have shown the practicability of designing machines and cycles and fixturing capable of taking an entire family of parts, cylinder blocks and heads, running them either in mixes or in batches.

One recent installation (Saginaw Steering Gear) demonstrated that an enormous transfer machine for machining the gear box for power steering was, in effect, a precision instrument. The nature of the tolerances on dimensions and on the spacing of bores and locations made it the ONLY practical method, far superior to previous ways of doing a similar job.

The ingenuity of transfer ma-

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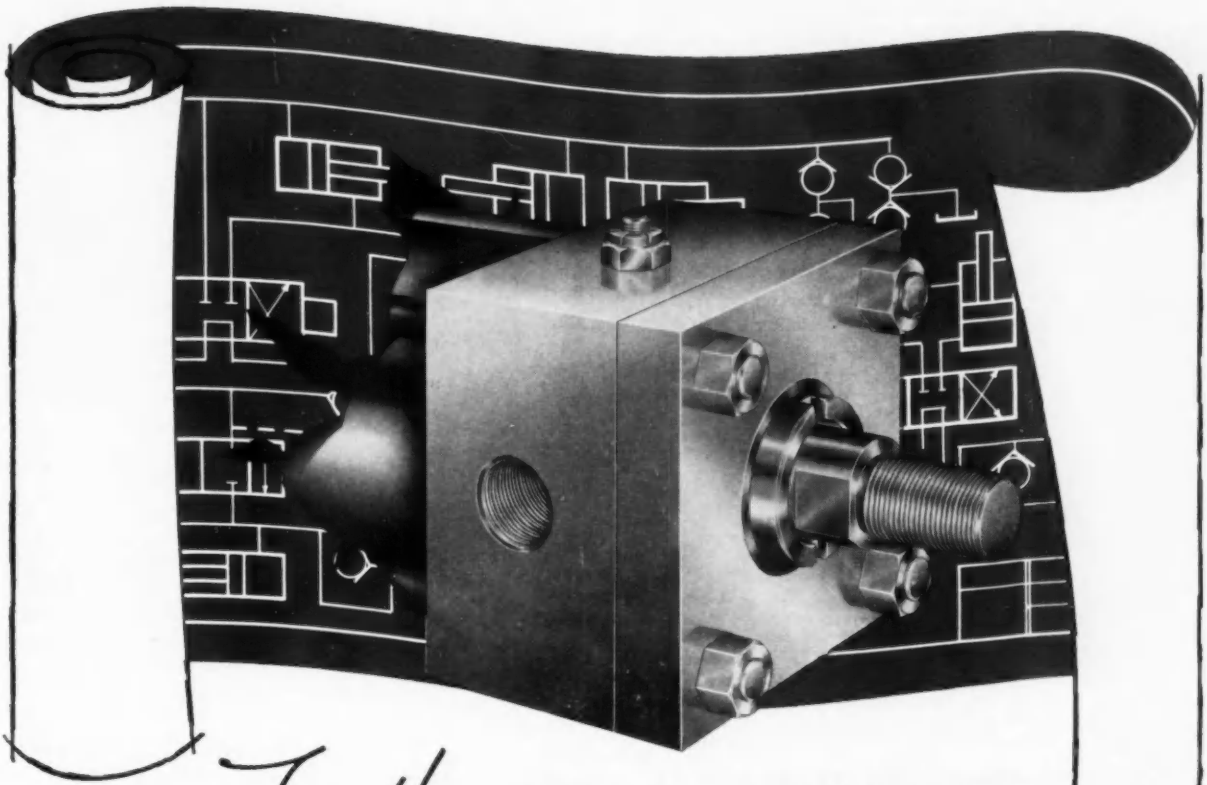

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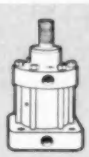

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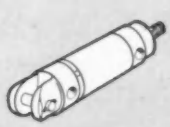
STANDARD PNEUMATIC



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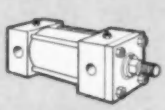

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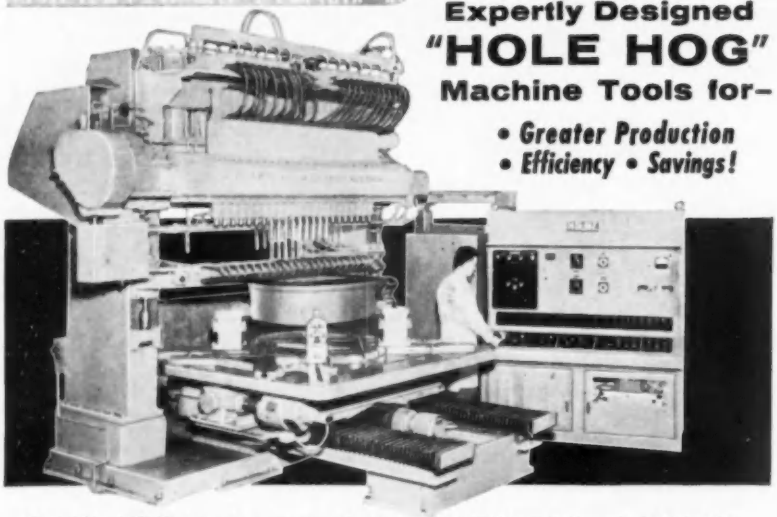

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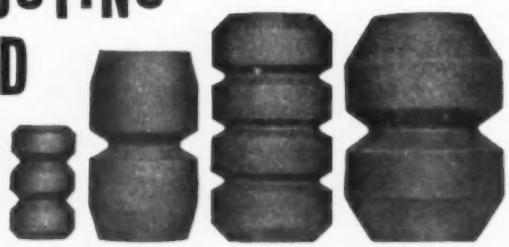

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chine designers should make it economical for parts makers, even those producing in smaller numbers, to take advantage of this technique.

The automotive group has been working with NMTBA during the past two years on a project to create certain standard conditions in the layout of general purpose machines. The objective is to make it possible to create machine tools which can accommodate fixturing from similar machines of the same rating but made by different manufacturers. As the project develops, it will be possible for a plant using general purpose machines to shift the work load from one make of machine to another in the event of a break-down of some machine. In such emergencies today it is frequently necessary to build an entirely new fixture, if indeed the part can be accommodated, with a consequent loss of time and money.

Numerically Controlled Machines

Numerical control is the latest and most versatile member of the machine tool family. It was conceived originally to meet an imperative need in the aircraft industry and mostly for military purposes. Over a period of time numerically controlled machines have been made more versatile, easier to handle. Computer elements have become more compact and highly developed. And given time and more volume such equipment should be within reach of more manufacturers without the benefit of taxpayers' money.

Applications in the automotive

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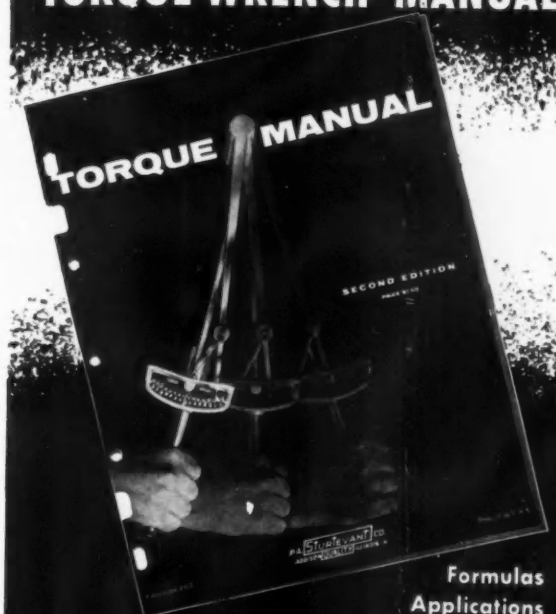

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industries have been slow in coming. There may be more applications but we have had a line on just a handful. One of the most potent is the Kearney & Trecker single-spindle mill at Detroit Diesel. This has been fixtured and tapes made for producing over 50 different parts required in small numbers, usually 100 pieces or less. Detroit Diesel builds a wide line of engines for hundreds of customers. And on many installations they require special parts and brackets. Where formerly the company required a fairly large miscellaneous machine shop department with a full complement of a variety of general purpose machines, plus skilled machinists, the single tape controlled machine now handles all of the volume.

One of the tractor builders has installed a Sundstrand numerically controlled machine for milling locating spots on crankshafts. Formerly this would have required the installation of as many single, specialized milling machines as the number of crankshafts involved. Now the one machine takes five or more crankshafts.

Another tractor builder recently installed a numerically controlled machine for a variety of operations on rear axle housing ends. These housings vary in size and detail for a number of models. Here it was found more economical to install a single, expensive numerically controlled machine, rather than to program a number of large way-type drilling and boring machines.

These are isolated examples but they may give our readers a clue to other special applications in their own products. ■

Gas Turbine Contract

The Canadian Commercial Corp. (for Orenda Engines, Ltd., Melton, Ontario, Canada), has been awarded a contract for a joint U. S. Army-Navy development of a 600 hp gas turbine engine for marine and vehicular applications.

Rear Adm. R. K. James, chief of the Navy's Bureau of Ships, said the objective of the program is to develop a gas turbine having a fuel consumption comparable to Diesel engines and better than gasoline engines.

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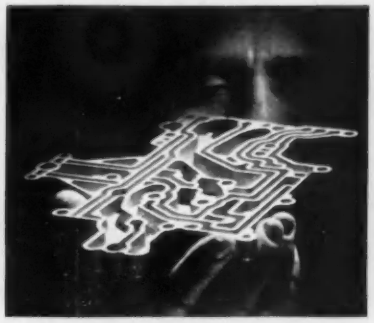
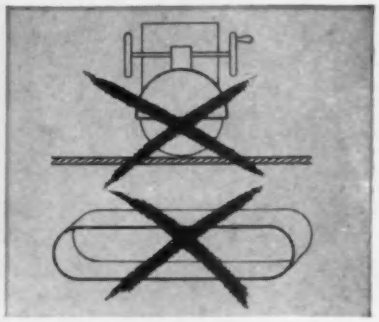
Aluminum Problems?

See how the LAPMASTER can lick 'em...

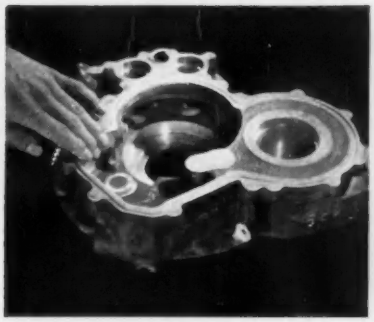
CLAMPING ELIMINATED. Aluminum, magnesium and all non-ferrous metals can't take clamping without warp or distortion. The Lapmaster eliminates this serious problem because flat surfaces are lapped in a free, unclamped state. Flatness checks show that the Lapmaster *consistently* produces surfaces to extremely close tolerances... even irregularly shaped parts, like those above, pass the most rigid inspection for flatness.



"AS-CAST" WARPAGE REMOVED FAST. Lapmasters quickly rectify "as-cast" warpage on flat surfaces of non-ferrous metal parts. Lapping produces the true, flat reference plane desired for subsequent machining. In other instances where parts become distorted due to clamping and chucking operations, a short, follow-up cycle on a Lapmaster will return the surfaces to their original flat condition.

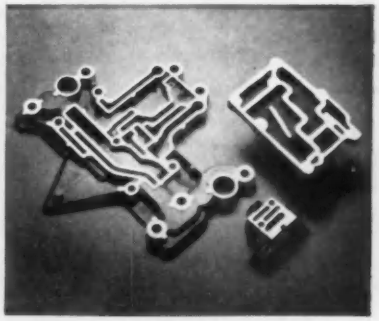


GRINDING PROBLEMS VANISH. There is no such thing as "lap plate loading". If you've tried grinding or belt sanding aluminum or magnesium, you know how fast the wheels load... how difficult and costly it is to prevent surface gouging, ripping or tearing. But with the Lapmaster method of stock removal, you never face such problems. Instead, you get uniform accuracy and a scratch-free finish, piece-after-piece.



NO MORE BURRS. After lapping on a Lapmaster, burrs just don't exist. Finger testing proves it every time. Lapping eliminates the expense of subsequent hand deburring operations and helps reduce inspection costs. This advantage is especially important in the finishing of pump, compressor or engine parts or on parts incorporating "O" ring groove on the face.

FAST STOCK REMOVAL. Lapping of non-ferrous metals on a Lapmaster is a finishing method that saves time and money for hundreds of manufacturers. Stock removal rates are high. Other methods requiring expensive tooling still cannot match the accuracy of lapping. And Lapmasters do it right the first time, every time.



PERFECTLY MATED SURFACES. In many cases, Lapmasters eliminate difficult gasketing problems by lapping mating surfaces to microinch finishes of 2 to 3 AA, to flatness within one light band (.0000116") or less and parallelity of exacting tolerances. The Lapmaster, for example, produces mating surfaces on aluminum transmission parts that will hold oil at 200 psi. Its uniform accuracy also eliminates selective assembly.

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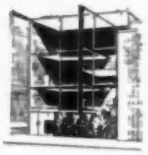
A CHILTON  PUBLICATION

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A

Acheson Colloids Co. ... 162
Air Reduction Sales Co. ... 35
Alemite Div. Stewart-Warner Corp. ... 141
Allied Research Products Inc. ... 126
Amchem Products Inc. ... 134-135
American Oil Co. ... 32
Amplex Div., Chrysler Corp. ... 30-31
Armco Steel Corp. ... 36-37
Auburn Manufacturing Co. ... 165
Automatic Spring Coiling Co. ... 8

B

Barnes Drill Co. ... 44
Beaver Pipe Tools Inc. ... 131
Bendix Corp., Products Div. ... 5
Bethlehem Steel Co. ... 39
Binks Manufacturing Co. ... 130
Bullard Co. ... 38

C

Classified Advertisements ... 164
Clearing Div., U. S. Industries Back Cover
Cleco Div., Reed Roller Bit Co. ... 26
Clum Manufacturing Co. ... 165
Cone Automatic Machine Co., Inc. ... 144-145
Controls Co. of America ... 45
Copperweld Steel Co. ... 2nd Cover
Crane Packing Co. ... 167
Cross Company ... 10-11
Crucible Steel Co. of America ... 16

D

Danly Machine Specialties Inc. ... 24
Detroit Power Screwdriver Co. ... 160
Doehler-Jarvis Div., National Lead Co. ... 149
Dow Chemical Co. ... 121
duPont de Nemours Co., E. I. Polychemicals ... 40-41
Dykem Co. ... 165

E

Eaton Manufacturing Co. Dynamatic Div. ... 62
Electric Furnace Co. ... 28
Engineering Castings Inc. ... 142
Enjay Chemical Co. ... 29
Evans Products Co. ... 133
Ex-Cell-O Corp. ... 15, 17, 19, 21

G

Gisholt Machine Co. ... 139
Gleason Works ... 159
Goodrich Chemical Co., B. F. ... 57
Gould-National Batteries Inc. ... 42-43
Greenfield Tap & Die ... 51
Greenlee Bros. & Co. ... 72

H

Hansen Manufacturing Co. ... 156
Heald Machine Co. ... 70
Hobart Brothers Co. ... 9
Hoffman Industries, Inc. ... 50
Houghton & Co., E. F. ... 34

I

International Nickel Co., Inc. ... 2

K

Kohler Company ... 166
Koppers Co., Inc. ... 124

L

Landis Tool Co. ... 152-153
Lincoln Electric Co. ... 48-49
Luber-Finer, Inc. ... 138

M

Michigan Tool Co. ... 151
Micromatic Hone Corp. ... 122
Moline Tool Co. ... 164
Moog Industries, Inc. ... 164

N

National Acme Co. ... 154-155
National Broach & Machine Co. ... 12
National Machine Products Co. ... 161
National Screw & Mfg. Co. ... 132

O

Oakite Products Inc. ... 146
Ohio Rubber Co. ... 136
Ohio Seamless Tube Div. ... 60-61
Olin Mathieson ... 59
Osborn Manufacturing Co. ... 148
Owatonna Tool Co. ... 46

P

Parker Hannifin Corp. ... 158
Polymer Corp. ... 140

R

RCA Ind'l Electronics Products ... 143
Raybestos-Manhattan, Inc. Adhesive Div. ... 129
Equipment Sales Div. ... 128
Research Products Corp. ... 161
Roebling's Sons Div., John A. ... 33
Rotor Tool Co. ... 25
Russell, Burdsall & Ward ... 18

S

Schwitzer Corp. ... 157
Shakeproof Div. ... 137
Silicones Div., Union Carbide Corp. ... 1
Southern Screw Co. ... 13
Sterling Aluminum Products Inc. ... 150
Stewart-Warner Corp. ... 141
Sturtevant Co., P. A. ... 165

T

Texaco Inc. ... 47
Thompson Products, Ramco Div. ... 27
Timken Roller Bearing Co. ... 147
Tinnerman Products Inc. ... 58
Tomkins-Johnson Co. ... 163
Torrington Co. ... 68

U

Udylite Corp. ... 22-23
United States Steel Corp. ... 14

W

Wales Strippit Inc. ... 52
Wausau Motor Parts Co. ... 3rd Cover
Wheeling Steel Corp. ... 20

Y

Youngstown Sheet & Tube Co. ... 6-7

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By C. J. Kelly
ASSISTANT EDITOR

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A new catalog of diamond wheels and diamond hones contains general information on diamond wheels, recommended starting specifications for a wide variety of work, prices, and a section of wheels for silicon and germanium cutting. *Norton Co.*

Lubricants 2

An all new comprehensive 20 page plastic-bound booklet offers a valuable collection of information featuring the basic concept of molybdenum disulfide additives employed to enhance temperature capabilities of lubricants. It contains two pages of charts, diagraming the reduction of frictional resistance between moving parts. *Hercules Packing Corp.*

Equipment 3

Condensed catalog CS-6, 15 pages, covers a complete line of industrial manufacturing equipment. Included are illustrations, specifications charts and performance data. Various features, both standard and special, are covered. *The Cincinnati Shaper Co.*

Workshop Courses 4

Four short workshop courses designed to upgrade the ability of key personnel to direct, control and evaluate fusion welding operations will again be conducted this fall by Hobart Brothers Technical School, Troy, Ohio. Each course is for a five day period. Text and a complete package of reference material will be furnished. Registration fee will be $50.00 per man per course. *Hobart Brothers Technical School.*

Electric Set 5

Features of the 20-35 KW "Sure Power" electric set are highlighted in a new three-fold, two-color piece of literature (BU-752) now available from the Company. It tells about the G-226 gasoline engine that powers the set and about the A-C brushless generator that is used. Specifications of the basic set are included. Important components are illustrated. There are also photos of typical jobs on which this and other electric sets from 20 to 300 KW and larger are being used. *Allis-Chalmers Mfg. Co., Tractor Group.*

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41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220
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241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260
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Industrial Relays 6

Bulletin GEA-7329, twelve pages, describes new 10 ampere, 300 volt industrial relay designed to cut significantly control panel space requirements. Publication discusses elimination of the need for a wiring trough, one of the major factors in reducing space needs. Photo with call-outs explains how the new relay is designed to make wiring and installations easier. Changing of contacts and coils for greater flexibility and reduction of inventory costs are also discussed along with the ease of making up new forms from the basic two-pole and four-pole relays. *General Electric Co.*

Air Control 7

A digest-size catalog of air control products for automating inplant operations and for component use in new products is offered. The 48-page catalog describes a line of air and hydraulic equipment. Information on dimensions, flow rates, and operating pressures, whenever applicable, as well as a number of typical air control circuits are included. All sections are color-indexed for rapid and convenient references. *A. Schrader's Son, Div. of Scovill Mfg. Co., Inc.*

Beryllium Bolts 8

An eminently readable review of the development of the first beryllium structural bolting is contained in a compact reference piece. The treatment provides more than just a rundown of the high strength-weight ratio beryllium shear bolts recently introduced by SPS. Starting as it does with the year 50 A.D., this basic treatise affords an easily digested review of the history of beryllium to date as a lightweight, structural material. *Standard Pressed Steel Corp.*

Terminal Blocks 9

A new line of solderless terminal blocks for communications, data processing and broadcast equipment is described and illustrated in four-page brochure, K2-5. Male terminals on the boards mate with snap-on solderless terminals. The boards are designed to function in audio, control, video and pulse circuits. Cost and space saving features are detailed. *Thomas & Betts Co.*

Torque Standards 10

A new four-page folder describing methods for establishing consistent standards for power-wrench accuracy has just been published. The literature explains how to detect and correct torque-output loss in older impact tools, and lists the simple steps to a systematic maintenance program for full production efficiency. The brochure also illustrates a method for calibrating power wrenches to within 2 pct accuracy.

Designed Aluminum 11

"Designed Surfaces" is the name of a new publication which shows 41 different forms of patterned aluminum sheet. This literature was designed to aid the designer and product engineer. The publication serves as both a source of inspiration and a technical reference to the patterns catalogued. It supplies data on the length and width, and information on the alloys and tempers in which each pattern is available. *Aluminum Company of America*

Lap-Grinding 12

Various models and types of lapping equipment are illustrated in a six page folder which discusses the advantages of this equipment. A chart and a graph cover technical information on approximate rates of stock removal and capacities of the mahcines. Dimensions of lap wheel is given for each model illustrated. *Speedlap Corp.*

Floor Coating 13

Epoxy coating for coating plant plant floors is discussed in a 4 page folder. This coating is designed for both wooden and concrete floors. Illustrations and text tells how the coating prolongs and protects floor life from wear. *The Hallemite Mfg. Co.*

Industrial Cranes 14

Overhead industrial cranes for numerous applications are discussed in a 20 page booklet. Illustrations of actual operations, integral components and line drawings are included to show quality and construction of this line. Dimension charts and specification information are shown. *Manning, Maxwell & Moore, Inc.*

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Milling Machine 15

This 20 page bulletin presents complete specifications, including illustrations covering construction features, operations and optional equipment for the new Dynamaster number 2 Universal milling machines. These machines are available with either 3, 5, 7½ or dual 10/5 horsepower spindle drive motors and an exclusive automatic climb milling arrangement. *Machine Tool Div., Brown & Sharpe Mfg. Co.*

Specialization 16

Specialization in Teflon products is featured in new 8 page bulletin R3017. Illustrations show many products and processing operations on this fluorocarbon resin and on formulations containing reinforcing agents, which the firm has trade-named Salox for nationwide distribution. The bulletin includes the company's new Teflon and Salox X-Seal rings, featured in the cover design and conventional products such as O-rings, back-up rings, packings, molded parts, extrusions, and machined parts. *Allegheny Plastics, Inc.*

Fiberglass 17

A new, informative brochure outlining the many and varied applications of reinforced fiberglass in industry has been published. In the new literature, Glastronics compares their versatile product with other popular fabricating materials and sets down specific advantages to be gained by using reinforced fiberglass in installations commonly calling for metal construction. Photographs of recent projects comprise a major part of the new brochure, serving to indicate the sphere of reinforced fiberglass application in any industry. *Glastronics.*

Electric Car 18

A new 4-page brochure summarizes performance and applications of the Delwick Electric Car for industry. The new light-weight, low cost personnel and cargo vehicle especially was designed for in-plant use. All specifications are included, such as size, weight, speed, payload, and range. The specifications for a trailer for use with the electric car are also in the brochure. *Namisco, Inc.*

New Steels 19

A new bulletin describing the properties of Nickel - Copper - Titanium High Strength Forming steels has been made available. The six-page booklet describes the combination of high strength and excellent forming properties with good weldability and superior resistance to corrosion, and gives the product range in which these new high-strength low-alloy steels are made. Included are sheets and plates, bars, shapes, and electric-weld tubular products. *Jones & Laughlin Steel Corp.*

Low Alloy Steels 20

A new bulletin describing the JLX-W series of high strength low alloy steels is available. The six-page folder describes the forming characteristics and weldability of the new JLX-W series, in which small quantities of columbium replace amounts of carbon and manganese. Charts, a graph and application data are included. *Jones & Laughlin Steel Corp.*

Phenolic Molding 21

A six-page illustrated folder gives guidelines for designing with phenolic molding compounds. It lists typical applications and design properties of these materials and compares their costs with those of metals. Of value to the designer, molder or end user, the publication is designated CDC-394. *General Electric Co., Chemical Materials Dept.*

Anode and Plating 22

An eight page bulletin, AC-113, illustrates and describes a full line of anodes, anode accessories and chemicals for electroplating and metalfinishing. Nickel, cadmium, brass and bronze, copper, lead and zinc anodes are described and illustrated. Various types of nickel anodes are listed along with recommended applications and pH ranges. One full page of drawings gives instructions on how to order hooks for round, flat and shaped lead anodes. Descriptions and recommended applications are given for several styles of laboratory checked anode bags. Instructions on how to order regular anode hooks are also given. *Hanson-Van Winkle-Munning Co.*

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Torque Data 23

"Why a Torque Converter is Standard Equipment in the Eimco Tractor Unique Power Train" is the title of a new bulletin. This 24-page book outlines through pictures, graphs, cartoons, and sketches just what is torque and how a torque converter works, and the advantages of a single-stage torque converter. *Eimco Corp.*

Ball Bearings 24

Bulletin B-61 presents a line of standard unground ball bearings in single and double race construction, plain or flanged design. Outside diameters range from 1 to 4¾ in., with round or hexagon bores, and load capacities up to 1000 lbs at 250 rpm. *Saginaw Products Corp.*

Warehousing 25

The "warehousing" approach to management of materials flow is explained in detail in a new 16 page brochure. Illustrating equipment and techniques for live storage and transportation of raw materials and finished products, the new publication offers ideas for manufacturers, wholesalers and retailers, based on successful application of warehousing science to problems of materials management. *Rapids-Standard Co., Inc.*

Case Study 26

The second in a series of case study portfolios on "Fatigue-Proof" Steel Bars is now available. The latest portfolio deals with the effect of "Fatigue-Proof" on end costs in typical parts applications. It reveals dollar-and-cents savings in individual studies on ten subjects. In addition to an illustration of each part, other pertinent information includes the dimensions of the part, its use, the AISI grade and hardness of the steel replaced, plus the operations eliminated. *La Salle Steel Co.*

Metal-Teflon Hose 27

A new 4 page technical bulletin describes bronze wire braided hose containing an inner core of Teflon. In addition to features and applications, bulletin number 29 has one section on attachable, reusable fittings, and a section on "how to order." *Atlantic Metal Hose Co., Inc.*

Cylinders 28

An improved new "CLA SERIES" 1⅛ in clamp type 150 psi air-250 psi hydraulic cylinder with universal, clevis, pivot or stud mountings, plus an improved extra compact "Val-N-Head" solenoid operated cylinder, is described in bulletin 861. *The Sheffer Corp.*

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INSTRUCTIONS FOR USE

Use this planning sheet to check on your modernization requirements plans. For details on typical cost and performance data, by types of machine tools, refer to the A. I. September 1st issue, main editorial section.

Metalwo

Type of Machine or Equipment	Added Production Efficiency*		Inventory Problems	
	Increased Productivity of 1960 Model vs. 1950 Model Machine Tools		Below: For each type of machine tool list the major types of production jobs where new tools are needed now . . .	
	% Increases in Output (Est.)	% Savings on product production cost (est.)		
TRANSFER MACHINES	—	—		
NUMERICAL CONTROL	—	—		
BORING	63	31		
BROACHING	15	10		
CUT-OFF	53	42		
DRILLING	29	18		
GEAR-CUTTING	40	23		
GRINDING	38	24		
HONING	50	45		
LATHES	28	13		
MILLING	36	24		
PLANERS	27	5		
POLISHING & BUFFING	75	—		

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Report Cost Study	New Tool Proposed	Estimate Savings	Project Proposal
Below: Fill in the spaces below with brief note about analysis of current output and costs for each "problem job."	Below: List the name and type of new tool being considered for each type of production "problem job"...	Below: Estimate the savings in production costs which can be expected if new tools are used on each "problem job" . . .	Below: List the re ommended new to buying projects proper project nam or number for eac project . . .

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WORKSHEET

eport Cost Study	New Tool Proposed	Estimate Savings	Project Proposals
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Service

Plant: _____

Dept: _____

Analysts: _____

Date: _____

osals	Recommendations	Schedules	Comments
rec- tool s by name each	Below: List the key recommending steps to obtain company approval for each new tool purchase project . . .	Below: List time schedules for each new tool purchase project for delivery and final operating set-up . . .	Below: Use spaces for any additional data, comments or remarks . . .

BORING	63	31		
BROACHING	15	10		
CUT-OFF	53	42		
DRILLING	29	18		
GEAR-CUTTING	40	23		
GRINDING	38	24		
HONING	50	45		
LATHES	28	13		
MILLING	36	24		
PLANERS	27	5		
POLISHING & BUFFING	75	—		
SHAPERS	59	—		
THREADING & TAPPING	27	8		
BENDING & FORMING	51	25		
HYDRAULIC PRESSES	32	10		
MECHANICAL PRESSES	45	26		
PUNCHING & SHEARING	30	43		
WELDING	—	—		
HEAT TREATING	—	—		
METAL CLEANING	—	—		
MISCELLANEOUS	—	—		

*Based on A.I. "Making Production Pay" Report No. 1, Sept. 1st

. 1st, 1960 issue

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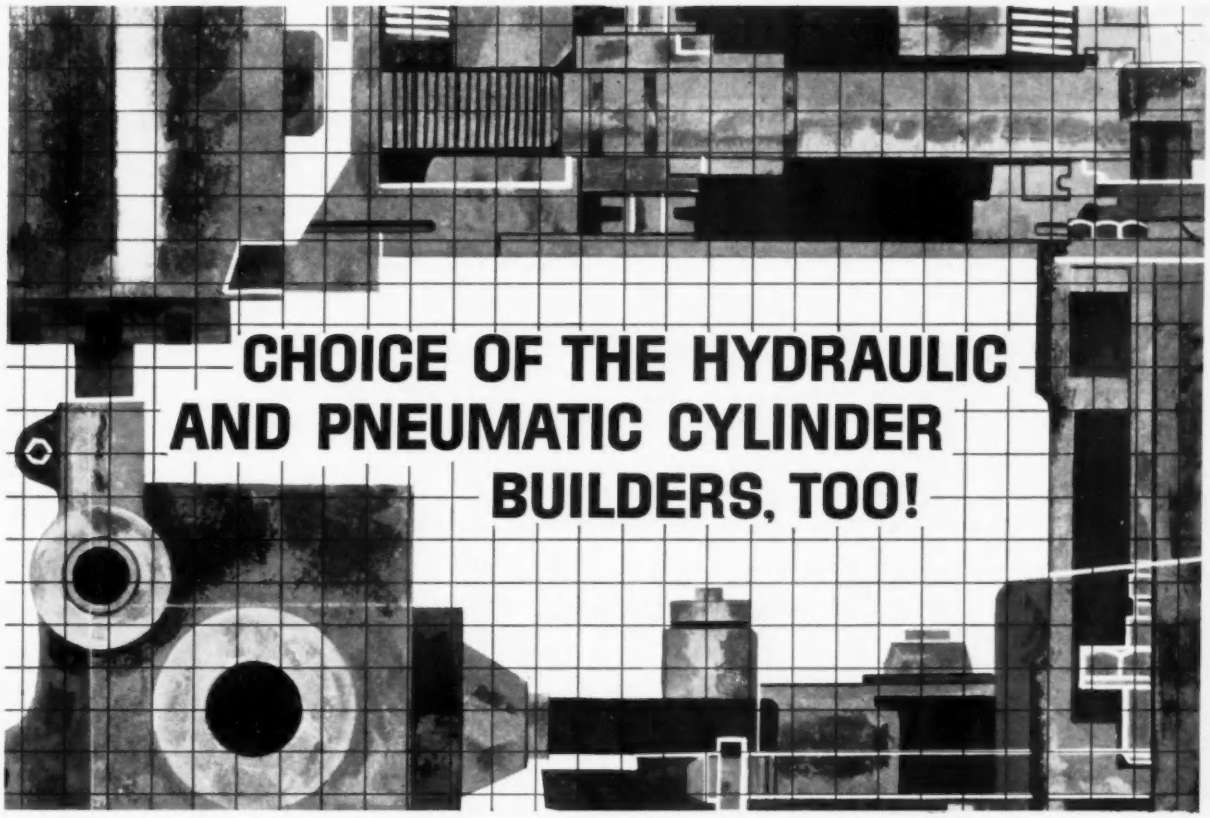

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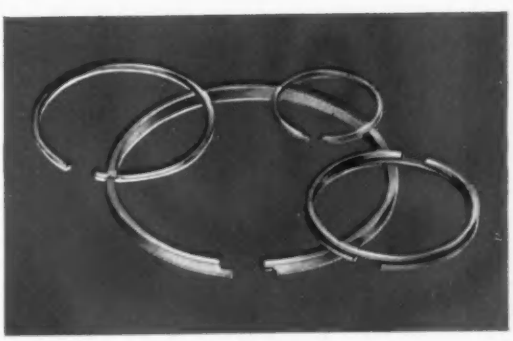

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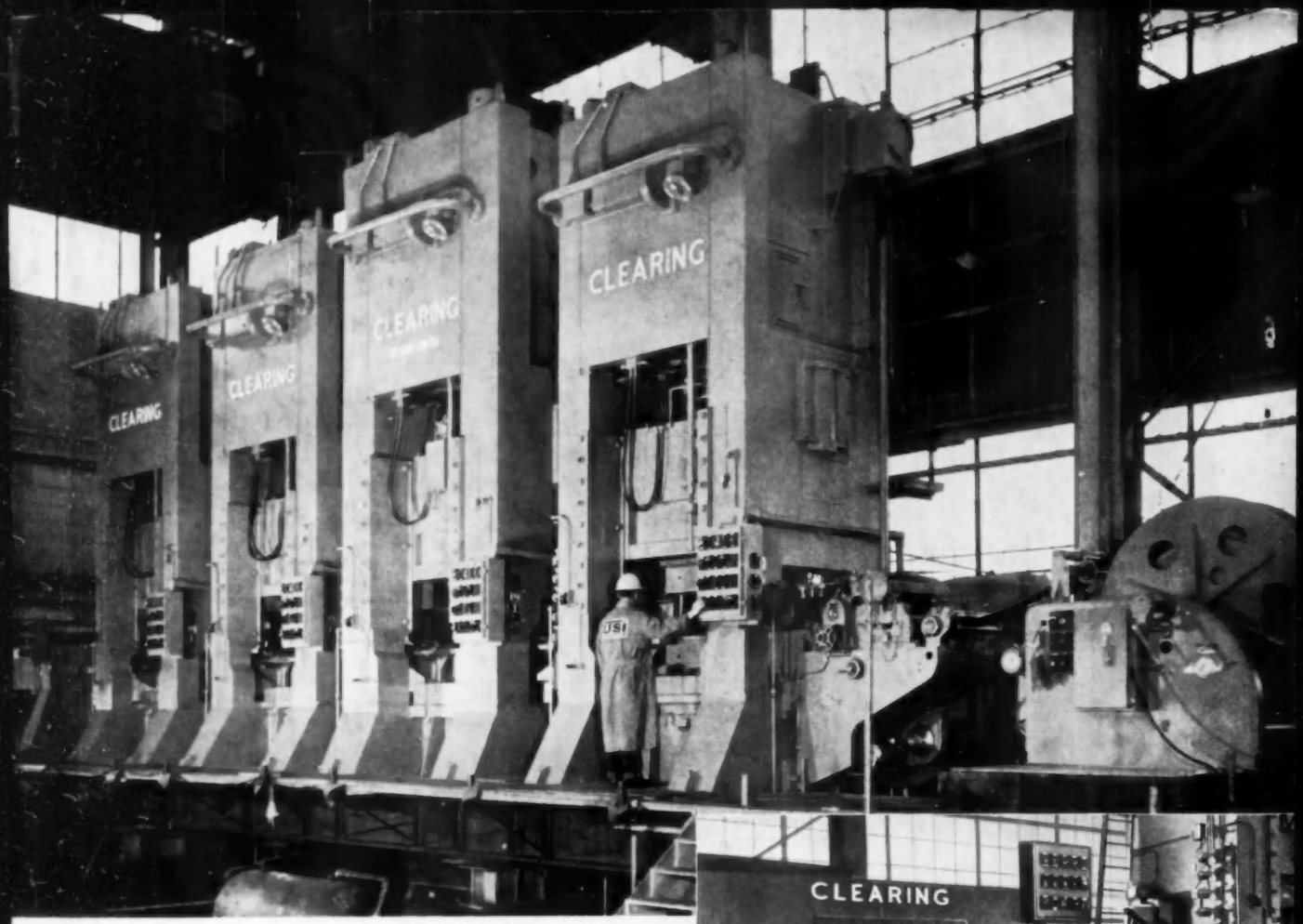

Closeup of the massive automatic feed drive for the Clearing production system above.

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Telephone PO 7-8700

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